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BULLETIN

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AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

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Studies upon Akenes and Seedlings of Plants of the Order Compositæ.

By W. W. Rowlee.

(Plates CXXXIV.—CXXXVIII.)

General Observations.

The fruit of the plants, belonging to the Order Compositæ is no less remarkable for its variety of external form than for its uniformity in internal structure. In the mature fruit, the calyx and the carpellary coats are completely combined, so that they cannot be distinguished by any structural differences. The integument of the seed may be separated from the others, and is a delicate polished membrane, wrapped rather closely around the embryo. The limb of the calyx, although sometimes obsolete (*Chrysanthemum Leucanthemum et. al.*) more often appears as a crown or cup (*Anthemis arvensis et. al.*) or a set of teeth or scales (*Helenium autumnale et. al.*) or as a tuft of bristles or hairs (*Aster et. al.*) When the limb of the calyx takes on any of these forms it is called the pappus. In *Lactuca*, *Taraxacum*, *et. al.*, the pappus is raised far above the akene by a prolongation of the calyx into a slender beak. The akene may be terete, striate, ribbed, angled, or winged. It may be glabrous, hairy, silky, or even spiny. It is usually larger above and tapering downward, but this is not always the case. There is more or less of an opening left at the base of the akene when it falls from the receptacle through which the hypocotyl emerges when the seed germinates. These are but a few of the general ways in which the akene varies externally. To enumerate all the variations would necessitate a description of every species.

The akene is one-celled, containing a single anatropous, exalbuminous seed with a straight embryo. The embryo conforms in shape and size to the enclosing walls. In *Bidens* and *Coreopsis* it is much flattened and narrows abruptly at the base; in *Eupatorium* and *Mikania* it is cylindrical; and in *Helianthus*, *Aster* and *Solidago* and many others it is top-shaped, the cotyledons filling the upper thicker portion of the akene, and these narrowed below into the still narrower hypocotyl. The cotyledons are usually longer and broader than the hypocotyl, but this is not always the case, (as asserted in Gray's Syn. Fl. of N. A., p. 48). In *Ambrosia* the hypocotyl is very small; in *Aster*, *Solidago*, and *Coreopsis* the hypocotyl is larger, but still is much shorter and narrower than the cotyledons; in *Eupatorium* and *Mikania* it is as long, or longer than the cotyledons, and is nearly, if not quite as broad. The plumule is minute, but may be seen in a vertical section of the seed. The cotyledons are closely applied to each other, their faces being in the same plane in which the seed is flattened.

Germination begins by the growth of the hypocotyl, and its first evidence is the protrusion of that organ through the aperture at the base of the akene. The cotyledons enlarge, sometimes splitting the akene and thereby emerging; sometimes, especially in those cases where the akene is small, withdrawing entirely, and leaving the akene a mere shell. Akenes planted out doors in autumn germinate promptly in the spring.

The seedling always has two cotyledons which are nearly or quite alike. They vary in size from an inch long in *Ambrosia trifida* and *Helianthus annuus* to minute in the *Artemisias* and *Chrysanthemums*. They are all the way from nearly sessile in *Chrysanthemum* and *Anthemis* to long-petioled in *Prenanthes* and *Arctium*. The bases of the petioles form a sheath around the plumule when the seedling is young. This sheath is widely dilated in *Anthemis*, but in most cases appears as a continuation of the hypocotyl. The cotyledons, although differing in some respects, display a striking uniformity throughout the order. They vary from spatulate to orbicular; in a majority of cases, however, being oblong. They are entire and usually narrowed abruptly into the petiole. The midvein is usually prominent, and may run to the apex or may fork somewhat below. In some species two lateral veins follow the petiole, diverge at the base of the blade and ramify near the margins of the leaf. They and their branches reticulate with the branches of the midvein. When the lateral veins are not present the branches of the midvein reticulate with each other. The hypocotyl is of considerable length, sometimes slightly flattened. The tap-root, at first well marked, is sometimes lost among its fibrous branches, sometimes maintaining supremacy throughout.

In one species, at least, branches arise normally from the axils of the cotyledons (*Coreopsis discoidea*). In *Anthemis arvensis* branches arise, if not from the cotyledons, from the axils of the first leaves.

In some species the leaves, like the cotyledons, are opposite during the whole life of the plant. The remainder are of the two-fifths arrangement. The first internodes may not elongate; thus is brought about the radical leaved forms. The Phyllotaxy of these, however, may be detected by the sequence of development.

The leaves may immediately assume very nearly the form of the mature plant. This is the case in *Anthemis arvensis.* Usually, however, there is a gradual transition in the first leaves from the cotyledons to the leaves of the mature plant. In *Chrysanthemum Leucanthemum* the first leaves are neither like the cotyledons nor the succeeding leaves.

In general it may be said that the first leaves show a tendency to retain the form of the cotyledons, but have the texture of the later leaves.

The germination of the seeds of annuals and biennials is much more prompt than is the germination of seeds of perennials. A much larger percentage of seeds of the former germinate also. Their seedlings are larger and more capable of withstanding hardships.

Several of the perennial plants of the order flower the first year. *Helenium autumnale* and *Aster Novæ-Angliæ* are among these. The biennials store up food in their tap-root (*Arctium, et al.*), or in the branches of it (*Lactuca*). Their leaves during the first year are radical and are usually of large size.

Germination.

The lines of inquiry undertaken in connection with the germination of seeds were several. Before planting, the percentage of apparently good seed matured by each species was noted. In this case fifty good seed were taken, and the number of unfilled seed found with them, be they more or less, was recorded.

Many fruits are provided with a pappus which serves a twofold purpose. It acts as a parachute and thereby assists in the dissemination of the seed; further it causes the seed to alight pappus end up, acting like the feathered end of an arrow. Now the parts of the embryo are so arranged that when the seed alights in this manner the cotyledons are up and the hypocotyl down. Thus the parts are placed in the most advantageous position for germination.

The 50 apparently perfect seeds of each species were divided equally, and one-half were planted with the pappus down and one-half with the pappus up. The figures given in the 3d and 4th columns of the accompanying table show the number which germinated in each case.

In the 5th column is shown the number germinated up to June 23. None germinated during the following summer. The seeds were planted the previous autumn (Nov. 23).

Finally the morphology of the seedlings was studied in different stages of development, and the peculiarities recorded in descriptions and drawings.

The seeds of various plants of the Order were gathered, care being taken that they be free from other seeds. Seeds were selected from several vigorous plants some distance apart, where that was practicable. The seeds were then taken from the heads indiscriminately, and carefully examined for any external evidences of poorness, and then by slight pressure with a needle to see whether or not they were filled. From the observations, the following statements may be made.

The number of seeds which, from their general appearance, can be detected as poor, is very variable among different species. In *Aster Novæ-Angliæ* var. *roseus* and *Solidago serotina* the number was large. In *Sericocarpus asteroides*, there were 2½ poor seeds to every good one. Those which ranged from 1½ poor ones to every good one, were *Ambrosia trifida* and *Helenium autumnale.* Two species perfected all of their seeds. These were *Polymnia Canadensis* and *Arctium Lappa.* Of the other species, eight perfected more and four less than one-half of the good seed.

Excluding *Aster Novæ-Angliæ* var. *roseus* and *Solidago serotina* (the poor seeds of which were only estimated), it was found that of the 17 remaining species, 1321 seeds were examined, 900 of which were good, and 471 or not quite 33 per cent. of the whole number were poor. The statements are all based upon a study of the seeds themselves before they were subjected to a test by germination. An estimate of the quality of seeds by a study of the external appearance of the seed itself must necessarily be uncertain, and is bound to overestimate the good seed. The test by germination on the other hand may not give the full value to the vitality of the seed, and can never overestimate the good seed contained. In column 5 is tabulated the number of seeds germinated of the 50 supposed to be good. Four of the 50 assorted or of the 80 unassorted seeds of *Aster Novæ-Angliæ* germinated. 5 per cent. of unassorted, 8 per cent. of assorted, is the rate of germination of this plant. Of the seeds of *Inula Helenium*, 45 germinated. This gives as its rate 70 per cent. of unassorted and 90 per cent. of assorted. The percentages of these and the other species are tabulated in columns 6 and 7.

Of the plants which may be considered as *persistent field weeds*, but two were grown. Their percentage of germination was very large, the first being the highest of all.

Arctium Lappa	78
Taraxacum officinale	19

The *way side and fence row weeds* in the order of their percentage of germination is as follows:

Inula Helenium	70
Heliopsis helianthoides	65
Lactuca spicata	55
Coreopsis discoidea	32
Ambrosia trifida	23
Eupatorium perfoliatum	16
Aster Novæ-Angliæ	5
Solidago serotina	1

The remainder, which may not be characterized as *weeds*, range as follows:

Cnicus muticus	33
Prenanthes Serpentaria	15
Helenium autumnale	13
Sericocarpus asteroides	4
Polymnia Canadensis	2
Gnaphalium obtusifolium	1
Senecio vulgaris	0
Aster Novæ-Angliæ var. roseus	1
Hieracium venosum	0

The general average is:

Persistent field weeds	49
Wayside and fence row weeds	33
Not weeds	8

This is direct evidence that the vitality of seeds of a species is a factor in determining the abundance of the plant and its ability to become a weed.

TABLE SHOWING THE VITALITY OF SEEDS.

SPECIES STUDIED.	Seed apparently perfect.	Seeds not filled.	25 seeds planted, pappus end down. No. germ.	25 seeds pappus end up. No. germ	Total number germinated.	Per cent. germination. Seed assorted.	Per cent. of germ. Seed unassorted.
Aster Novæ-Angliæ	50	30	1	3	4	8	5
Prenanthes Serpentaria	50	40	9	5	14	28	15
Eupatorium perfoliatum	50	29	6	6	12	24	16
Ambrosia trifida	50	63	13	13	26	52	23
Gnaphalium obtusifolium	50	15	1	0	1	2	1
Inula Helenium	50	15	21	24	45	90	70
Polymnia Canadensis	50	0	1	0	1	2	2
Arctium Lappa	50	0	19	20	39	78	78
Solidago serotina	50	Est.	7	13	20	40	1
Coreopsis discoidea	50	28	9	16	25	50	32
Senecio vulgaris	50	5	0	0	0	0	0
Heliopsis helianthoides	50	15	20	22	42	84	65
Sericocarpus asteroides	50	128	3	4	7	14	4
Helenium autumnale	50	70	8	8	16	32	13
Hieracium venosum	50	14	0	0	0	0	0
Taraxacum officinale	50	8	3	8	11	22	19
Cnicus muticus	50	8	11	8	19	38	53
Lactuca spicata	50	3	10	19	29	58	53
Aster Novæ-Angliæ var. *roseus*	50	Est.	7	9	16	32	1

Descriptions of Akenes and Seedlings.

Eupatorium perfoliatum, L. (Plate CXXXIV. A–D.) "Akene 5-angled destitute of intervening ribs." The outer wall minutely perforated, 2 mm. long, black, pappus as long as the akene, of about 20 capillary bristles. Embryo small; hypocotyl as long as or longer than the cotyledons, terete as is the whole embryo when the cotyledons are placed face to face.*

The cotyledons of the seedling plant are small, orbicular, the blade bent at an angle with its petiole. Petiole evident, but not long. Hypocotyl short, tap-root branching early. The hypocotyl soon bears roots up to the very base of the cotyledons. All the internodes lengthen. Leaves opposite. The first, second and third pairs are less and less petioled; the fourth pair are clasping, and the succeeding pairs are more or less perfoliate. The first and second internodes, and the accompaning leaves are less hairy than the remainder of the plant. The third and succeeding pairs of leaves take on more or less of the rugose character of the later ones. They also resemble the leaves of the mature plant in form. The plant does not blossom the first year, but grows to a height of a foot or more.

Solidago serotina, Ait. (PLATE CXXXIV. E–H.) The akene in this species is 10-costate and somewhat hairy, about one and three-fourth mm. long and one-third mm. wide. The pappus is nearly twice as long as the akene. The cotyledons in the seed are longer than the hypocotyl. The embryo tapers toward the base.

In the seedling the cotyledons are rather small, obovate-spatulate, short-petioled, hypocotyl as long as or longer than the cotyledons. The tap-root is soon indistinguishable from the other roots. The first internode elongates but little. The succeeding are gradually longer. The first leaf resembles the cotyledons in shape, but is ciliate along the margin, while the cotyledons are not. The hairs forming the cilia are upon the margined petioles of all the early leaves. They are longest at the sheathing base of the petioles, and grow shorter toward the apex of the leaf. Along the margin of the leaf they form merely a roughness. The early leaves are only faintly triple nerved. The tap-root is soon lost among the multitude of fibrous roots. During the first year's growth no flowers appeared. At the end of the season there was a decided tendency to multiply by underground shoots.

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* The statement made in the "Synoptical Flora of North America," (p. 48), to the effect that the ovule becomes "an exalbuminous seed with a straight embryo, the inferior radicle (hypocotyl) shorter and narrower than the cotyledons" is erroneous. In several, if not all the *Eupatoriums* and in *Mikania scandens*, the hypocotyl is as long as or longer than the cotyledons, and nearly, if not quite as broad.

Sericocarpus asteroides (L.) B. S. P. (Plate CXXXIV. I. K. L.) Akene only slightly compressed, 2-nerved, very silky; hence the generic name; 2 mm. long, 1 mm. broad; pappus more than twice the length of the akene, unequal, ferruginous. Embryo in vertical section, obovate. Cotyledons three times as long as the hypocotyl.

The seedling has small cotyledons. These are elliptical, or nearly orbicular, and smooth, petioled. Hypocotyl short. Tap-root prominent. The first leaf assumes the general characteristics of the later leaves. They are hairy above, smooth below, and ciliate along the margin of the blade and petiole.

Aster Novæ-Angliæ, L., var. *roseus*, Gray. (Plate CXXXIV. M–P.) Akene compressed, hairy, 10-ribbed, ovate, one-half as long as the soft pappus. Embryo with flattened cotyledons more than twice the length of the abruptly downward tapering hypocotyl.

Seedling with short hypocotyl. Cotyledons orbicular, small, smooth, short petioled. First four or five leaves narrowed to a petiole. The later leaves clasping. They, as well as the stem, pubescent. First internodes lengthening only slightly; the later much longer. Roots appear on the hypocotyl, and the tap-root is soon lost among them. Both this plant and the type *Aster Novæ-Angliæ* blossom during the first year. The seedling of this variety differs in no respect from that of the species unless it be that the lower leaves are narrower, and the clasping ones more narrowed above the auricled base. It would be necessary to observe more specimens before setting this down as an established fact.

Inula Helenium, L. (Plate CXXXIV. R. S. T. U.) Akene linear, obtuse at base, obscurely four-sided, striate, crowned at the top with the united bases of the pappus hairs. Pappus long (8 mm.) straw color, widely spreading from the top of the akene. Embryo subcylindrical, cotyledons twice the length of the hypocotyl.

Seedling medium in size. Cotyledons oblong, more than twice as long as broad; short-petioled, smooth; hypocotyl short; tap-root long and becoming thickened early; the first two leaves hairy, broader and longer petioled than the cotyledons. Although the leaves are of two-fifths arrangement, the first two twist sufficiently to stand nearly at right angles to the cotyledons. Internodes not elongated, hence the leaves appear in a rosette. The 3d and 4th leaves are obscurely sinuate-toothed, ovate, rugose, hairy, especially beneath. The succeeding ones are lance-elliptical, more conspicuously sinuate-toothed, long-petioled.

The plant shows no signs of flowering the first year. The tap-root thickens, however, preparatory to flowering the following year.

Helenium autumnale, L. (Plate CXXXIV. V. W. X.) Akene small, 8 or 10-costate, hairy, turbinate, crowned with the pappus which consists of 5 or 6 chaffy pointed scales about one-half as large as the akene.

Seedling mediocre, cotyledons oblong, about one-half as broad as long, short petioled. Hypocotyl longer than the cotyledons. Tap-root long, soon overtaken by the fibrous roots and lost among them. The seedlings resemble young plants of Ribgrass (*Plantago lanceolata*, L). The first and second leaves are elliptical and the succeeding are elliptical-lanceolate, 5-nerved, sparingly toothed. The plant is smooth throughout. The leaves although in a rosette, are evidently of the two-fifths arrangement. Seedlings flowered during the first year's growth.

Ambrosia trifida, L. (Plate CXXXV. A–F.) The "fruit" of this species consists not only of the akene as found in other composites, but is made up of the akene closely and completely invested by the gamophyllous involucre. It is "nut-like," beaked at the top and crowned by five or six short spines in a single series below the beak. The embryo is large and oily, obpyriform. It has a caruncle-like appendage at the inferior end of the hypocotyl. The cotyledons are thick and large; the hypocotyl small and tapering abruptly downward.

The seedlings are large, equalling in size the seedlings of *Helianthus annuus*. The cotyledons are nearly orbicular, thick, reticulate veined, narrowed at base into a short sheathing petiole. The hypocotyl is long and slightly flattened. The tap-root maintains supremacy throughout the life of the plant. The many rootlets given out at the junction of the tap-root and hypocotyl are followed by many similar ones from all parts of the primary root. The hypocotyl sometimes attains a length of two inches, but not often more than that. The cotyledons are at length borne on petioles as long as their blades. The first pair of leaves are obtuse, sometimes trifid, but more often only toothed. Sometimes one of the first pair of leaves will be trifid, the other not. The succeeding leaves are of the same nature as those of the mature plants. The leaves show a gradation from the rounded apex of the cotyledons to the acuminate final leaves. The plant is an annual.

Ambrosia artemisæfolia, L. The seeds and seedlings of this species differ from *A. trifida*, L, principally in size. The cotyledons, hypocotyl and root are less than one-half as large as the same parts in the larger plant. Another difference of much importance in determining the character of the plant, is the presence of buds in the axils of the lower leaves and cotyledons, and their early development into branches. Thus, early, is the diffuse nature of the plant determined. The buds of the lower axils, moreover, must be one of the characters by which the plant maintains its reputation as a persistent weed. The first pair of leaves are "trifid" or not; sometimes one is "trifid," the other not. The lobes of the leaves in *A. artemisæfolia* are more rounded than in *A. trifida* from the very first.

Xanthium Canadense, Mill. (Plate CXXXV. H–M.) There are two akenes contained within the bur-like involucre of each pistillate head. The akenes are plano-convex, the plane side toward the axis of the head. They are black, elliptical, and tipped with the long protruding, but withered style. The cotyledons of the embryo are slightly dissimilar, the one on the convex or outer side being somewhat thicker than the other. The hypocotyl is very short, not more than one-sixth the length of the cotyledons.

The seedling emerges from the bur in the same manner as the seedling of *Ambrosia*. Both akenes in a single head frequently germinate, usually not at the same time, however, so the seedlings will be at two stages of growth. The hypocotyl lengthens considerably. The conspicuous tap-root gives off numerous branches. The cotyledons are lanceolate, obtuse, somewhat narrowed at the base, strongly triple nerved. The first two leaves are nearly opposite; the succeeding become more and more distinctly alternate until, as in the mature plant, they are of the alternate type.

Seedlings, before the first leaves develop, have the hypocotyl bent nearly at right angles, thus causing its upper part and the cotyledons to lie upon the surface of the ground. At this stage of their growth there is every indication that the plant will be prostrate. It very soon straightens up, however, and by the time the first leaves are fully developed it is entirely erect. How the plant has come to assume this peculiar habit it is difficult to see.

Anthemis arvensis, L. (Plate CXXXVI. D. E. F.) Akenes roughly ribbed, not flattened, "crowned with a very short slightly toothed margin in place of a pappus."

Seedling with nearly sessile oblong cotyledons. Hypocotyl comparatively long. Tap-root evident. First two leaves pinnate. The succeeding bipinnate. The change from cotyledons to lobed leaves is abrupt.

The plant is a winter annual, that is from a plant ripening in July, seeds germinate the same autumn and remain over winter as seedlings. *A. Cotula*, L. (May weed) is, on the other hand, a summer annual. It ripens its seeds in autumn, and these do not germinate until the following spring and early summer.

Chrysanthemum Leucanthemum, L. (Plate CXXXVI. A. B. C.) Akene small (2 mm. long by ¾ mm. wide) 8 to 15-costate.

The costæ white, the intervening spaces black. Pappus none.

Cotyledons of seedlings small, short-petioled, the petioles united at the base into a short sheath; blade oblong, thick. First two leaves spatulate, entire, borne on petioles nearly as long as the blade. The later leaves are like the radical leaves of the mature plant. The first and second leaves in this species can hardly be said to be intermediate in form between the cotyledons and the succeeding leaves.

Achillea Millefolium, L. (Plate CXXXVI. G. H. J.) Akene obcompressed, margined, small. The margin white; pappus none.

Cotyledons small, nearly orbicular, closely sessile. First two leaves small, tridentate, or the second one with two pairs of lateral leaflets. Succeeding leaves like the leaves of the mature plant.

Artemisia Absinthium, L. (Plate CXXXVI. K. L. M.) Akene not flattened, obovate, smooth; pappus none.

Seedlings small. Cotyledons closely sessile, 2 mm, long by 1 mm. wide. First two leaves linear-oblong, thickish, entire. The third and frequently the fourth tridentate, the succeeding coarsely toothed, finally compound. These seedlings may be distinguished from those of *Achillea* by the second and third leaves being oblong, entire; and from *Chrysanthemum* by the third and fourth leaves being tridentate.

Heliopsis helianthoides (L.) B. S. P. (Plate CXXXVII. L–O.) Akene without pappus, 3 or 4 angled [Triangular in the ray (Syn. F. of N. A.)]. Embryo only slightly flattened.

Seedling of medium size. Cotyledons bent at the union of the blade and petiole, blade nearly orbicular, petioles as long as their blade. Leaves opposite, the first pair ovate-lanceolate. They and the succeeding minutely hairy, scabrous above, smooth below; the later pairs ovate, somewhat toothed. The stems of seedlings have two pubescent lines running from the axil of each leaf to the next node above. The lines like the pairs of leaves decussate, those of any internode being half way round the stem from the lines of the internode below or above. The plant produced a few flowers during the first year's growth.

Helianthus divaricatus, L. (Plate CXXXVII. E. F. G.) Seedlings of this species differ very much in appearance from those of the common sunflower (*H. annuus*). They are slightly hairy, small and slow of growth. The akene is top-shaped, smooth. Hypocotyl of embryo short and narrower than the cotyledons.

Seedlings with short petioled cotyledons. These are ovate and thick. The first internode elongates. First pair of leaves elliptical, sessile, ciliate, veiny. The seedlings of this plant differ from those of *Heliopsis* in the shape of the cotyledons, length of their petioles, and in having the stem uniformly hairy instead of hairy in lines as is so conspicuously the case in *Heliopsis*.

Coreopsis discoidea, Torr. and Gray. (Plate CXXXVII. H–K.) Akene much flattened with 2, 3 or 4 upwardly barbed awns at the summit, somewhat hairy; embryo much flattened; cotyledons oblong, twice as long as broad, narrowed rather abruptly at the base into the short slender hypocotyl.

The seedlings of this species and of *Ambrosia* germinated very promptly in the spring. The cotyledons are oblong, petioled. Hypocotyl long, bearing a few roots at its union with the tap-root. Branches developed from the axils of the cotyledons as well as the succeeding leaves, thus early determining the diffuse character of the mature plant. The first pair of leaves sparingly toothed, longer petioled than the cotyledons. The later leaves longer petioled and less sparingly toothed. The plant is an annual.

Cnicus arvensis (L.) Hoffm. (Plates CXXXVII. B. C. D.) Seeds are not produced in abundance in the vicinity of Ithaca, yet by a little search plenty can be found. They have a long plumose pappus, are smooth and only obscurely angled.

The seedlings with which this obnoxious weed begins its life history are innocent-appearing enough. The cotyledons although very like those of *C. lanceolatus and C. muticus* are very small. The first leaf is spiny on the margin, the succeedings ones becoming larger and more spiny. Roots are given off throughout the length of the hypocotyl. The cotyledons have no prominent mid-rib; they are ovate, fleshy and obscurely reticulate-nerved. The early leaves are in a rosette.

Arctium Lappa, L. (Plate CXXXVIII. A–F.) The akene of the Burdock is flattened parallel to the faces of the cotyledons. The pappus is about one-half its length and is deciduous. It is black and blistered. The hypocotyl in the seed is very short; the cotyledons are large, filling the greater part of the seed.

The seedling is rather large, and, like the mature plant, very tenacious of life. The hypocotyl is short, only about one-fourth the length of the tap-root, and one-half as long as the cotyledons. Prior to the development of leaves from the plumule, the tap-root branches very sparingly, and mostly at the point of union of root and hypocotyl. It evinces a disposition from the first to become thickened. The cotyledons are sheathing at the base, fleshy, oblong-spatulate, obscurely emarginate, pinnately nerved, the lateral nerves visible only after the tissue has been cleared by soaking in alcohol. Plumule not developed sufficiently to protrude from the sheathing bases of the cotyledons. The seedling even at this early stage emits the peculiar odor of the mature plant.

The first leaf is intermediate in form between the cotyledons and the mature leaves. It is ovate, obtuse, truncate or subcordate at base, sparingly denticulate. The petiole is nearly or quite as long as the leaf. The succeeding leaves are cordate, denticulate, pinnately veined. The plant is strictly biennial. During the first year there is no elongation of internodes, consequently the leaves are all radical. The tap-root thickens and elongates, but at no time is it profusely branched. The hypocotyl disappears, and the tap-root appears to extend up to the bases of the leaves.

Cnicus muticus (Michx.) Pursh. (Plate CXXXVIII. G–K.) The akene is dark-colored, obovate and smooth; pappus long-plumose. The cotyledons and very small hypocotyl are oily in the seed.

The cotyledons, when developed, are obovate, entire, rounded at the apex, tapering toward the base, reticulately veined, with well-marked mid-rib. Hypocotyl short; tap-root long, only slightly branched.

The first leaves are hairy on both sides, and, like the mature plant, bear prickles along their margins. The succeeding leaves take on more and more the runcinate character of the radical leaves of the mature plant. During the first year's growth the internodes do not elongate. The tap-root thickens and branches considerably.

Taraxacum officinale, Web. (Plate CXXXVIII. L–O.) The fruit of the Dandelion consists of three parts, the akene, the beak and the pappus. The beak is for the most part a growth which takes place after the flower has withered. The akene is short, spiny above, obovate, somewhat flattened in the plane of the faces of the cotyledons. The hypocotyl is terete, about one-third the length of the cotyledons. The latter are one-half as wide as long, and when placed face to face, as in the akene, they are sub-cylindrical.

In the seedling the cotyledons are small (5 to 8 mm.), obovate-spatulate, apex rounded. The hypocotyl is as long as the cotyledons; tap-root long, somewhat branched. The first leaves are sinuately toothed. Only the later take on the "dens de leonis" character. The tap-root thickens and branches, but retains supremacy during the life of the plant.

The plant does not blossom the first year. Several leaves appear, but in the seedlings grown there is no indication of a flowering scape. As is well-known, there is never any elongation of internodes in this species.

Prenanthes Serpentaria, Pursh. (Plate CXXXVIII. W. X. Y. Z.) Pappus straw-colored, spreading horizontally from the top of the akene at maturity. The akene awl-shaped, slightly flattened, dark brown. The cotyledons six times the length of the hypocotyl.

The cotyledons of the seedlings are raised upon petioles longer than their blades.* The blade is spatulate, bent at right angles with the petiole at their junction. The petioles unite at their base to form a sheath around the plumule. The hypocotyl is shorter than it appears to be on account of the united bases of the cotyledons appearing as its upper end. Tap-root prominent, not diffusely branched. First and second leaves, long-petioled. Petioles red, not margined. Blade broadly ovate, slightly lobed or toothed. Third and succeeding leaves deltoid as are the radical ones of the mature plant.

Prenanthes alba, L. Like the preceeding species except in the seedlings grown the several parts were smaller and less inclined to be colored.

Lactuca spicata (L.) Hitchc. (Plate CXXXVIII. P–V.) Fruit not beaked, differing in this respect from some of the species of this genus. Pappus one and a half times the length of the akene, dirty white, of about 30 capillary bristles. Akene flattened and ribbed. Seen from the side it is ovate-elliptical; from the edge, lunate. The embryo, in conformity with the seed, is much flattened, obovate; the cotyledons are three or four times the length of the hypocotyl.

The seedling is small; cotyledons elliptical, sparingly hairy, reticulately veined; hypocotyl short, one-half the length of the cotyledons; tap-root branching early.

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*I have in my possession a seedling plant of this species which has the petioles of the cotyledons united up to the blade on one side. The close cohesion of the lower portions of the cotyledons in the seed seems to indicate that this might often occur.

W. W. R.

The first leaf is strikingly different from the cotyledons. It is petioled, the petiole wing-margined, nearly or quite as long as the blade. Blade orbicular, entire, erect, roughish. The second leaf petioled like the first, the blade broadly ovate, sinuate-toothed, subcordate, pinnately veined. The third leaf toothed along the margined petiole, and the succeeding leaves becoming more and more runcinate. The tap-root is branched, it and its branches become fleshy-thickened during the first year's growth. The plant does not blossom during its first year's growth. It is strictly biennial.

Abbreviations Used in the Plates.

c.	cotyledons.	r^2.	branches of tap-root.
h.	hypocotyl.	pl.	plumule.
r^1.	tap-root.	p.	pappus.

l^1. l^2. l^3. etc., first, second, third, etc., leaves. I prefer to call the first leaf above the cotyledons the "first leaf" and let the cotyledons retain their special name.

Plate CXXXIV.

Eupatorium perfoliatum, L.

A. Seedling from which the cotyledons have fallen (x 2). B. Younger seedling with cotyledons (x 2). C. Fruit (x 10). D. Embryo removed from coats (x 10).

Solidago serotina, Ait.

E. Seedling (x 2) with cotyledons and first three leaves developed. F. Same still more developed (nat. size). G. Akene (x 10) with pappus. H. Vert. sect. of same (x 10).

Sericocarpus asteroides (L.) B. S. P.

I. Akene (x 10) with pappus. K. Vert. sect. of same (x 10). L. Seedling with first three leaves developed (x 2).

Aster Novæ-Angliæ, L. var. *roseus*, Gray.

M. Akene (x 5). N. Vert. sect. of same. O. Seedling with first two leaves (x 2). P. Same older (x 2).

Inula Helenium, L.

R. Akene (x 10). S. Seedling (x 2). T. and U. Same in later stages T. (x 1½), U. (nat. size).

Helenium autumnale, L.

V. Akene (x 10) with chaffy pappus p. W. Seedling (x 2). X. Same older (x 2).

Plate CXXXV.

Ambrosia trifida, L.

A. The nut-like fruit (x 4). B. The akene with involucre removed. C. The seed with the ovary coats removed. D. The embryo. E. Seedlings with cotyledons fully developed. F. An older seedling. E. and F. nat. size.

Xanthium Canadense, Mill.

G. Fruit with hooked prickles (x 2). H. Akene from side and edge. J. Cross sect. of cotyledons. K. Vertical sect. of same. L. Seedling. M. Same older. L. and M. nat. size.

Plate CXXXVI.

Chrysanthemum Leucanthemum, L.

A. Akene (x 8). B. Seedling (x 3). C. Same, older (nat. size).

Anthemis arvensis, L.

D. Akene (x 10). E. Seedling with first three leaves (x 2). F. Same, older (nat. size).

Achillea Millefolium, L.

G. Akene (x 10). H. Seedling (x 5). J. Same, older (x 5).

Artemisia Absinthium, L.

K. Akene (x 12) L. Seedling (x 3). M. Same, older (x 5).

Plate CXXXVII.

Cnicus arvensis (L.) Hoffm.

A. Akene (x 10). B. Embryo (x 10). C. Seedling (x 5). D. Same older.

Helianthus divaricatus, L.

E. Akene (x 3). F. Embryo (x 3). G. Seedling (nat. size).

Coreopsis discoidea, Torr. and Gr.

H. Akene (x 6). I. Embryo removed from coats (x 8). J. Seedling (x 2). K. Same older (nat. size).

Heliopsis helianthoides (L.) B. S. P.

L. Akene (x 5). M. Young seedling (x 2). N. Same older (nat. size). O. Internode of stem with two pubescent lines running from the axil of the leaf to the point (on the next node above,) between the bases of the leaves.

Plate CXXXVIII.

Arctium Lappa, L.

A. Seedling with cotyledons fully developed. B. Akene (x 3). C. Vertical section of akene. (x 3). D. Seedling with first leaf developed. E. Seedling with first three leaves developed. F. Cotyledon (x 5).

Cnicus muticus (Michx.) Pursh.

G. Seedling with cotyledons fully developed. H. Seedling with first two leaves l^1 and l^2 developed I. Akene (x 5). K. Vertical section of same.

Taraxacum officinale, Web.

L. Seedling (x 2) with cotyledons fully developed. M. Later stage of same with first two leaves l^1 l^2 developed. N. Akene (x 4). p. beak. O. Embryo (x 6) removed from its coats and with cotyledons spread apart.

Lactuca spicata (Lam.) Hitch.

P. R. and S. successive stages in the devolopment of seedling. S. Magnified three times the others natural size. T. Akene. U. Same (edge) (x 5). V. Embryo removed from coats (x 5).

Prenanthes Serpentaria, Pursh.

W. Seedling (x 3) X. Same at later stage (nat. size). L. Akene (x 5). Z. Vertica sect. of akene (x 7).

Asplenium Bradleyi, Eaton.

For some time I have been interested in the relationship of *Asplenium Bradleyi*, and the note by Mr. Middleton in a recent number of the BULLETIN has given me fresh zest in the matter.

During the summer of 1890 this rare fern was discovered by Mr. J. K. Small, on Eozoic rocks near the junction of the Tucquan Creek with the Susquehanna river, about eighteen miles from Lancaster. Last February we visited that place, and within a quarter of a mile of the original station found two more locations for it. On October 15, Miss E. Gertrude Halbach and myself discovered another station at McCall's Ferry, two miles further down the river.

As to its relationship with *A. viride*, I do not see how it can possibly be referred to that species, of which I have at hand three specimens, one from Owen Sound, Ontario, Canada, and two from Smuggler's Notch, Vermont. In these specimens the pinnae are more or less rounded, and the fruit dots crowded on the lower side toward the rachis. The pinnae, furthermore, are only two or three lines long and almost as broad, while the stipes are green, except near the base.

The pinnae of *A. Bradleyi* are very rarely inclined to be rounded, even in the smallest specimens that I have seen, one from Northwest Arkansas, collected by F. L. Harvey, one from Estill county, Kentucky, collected by John Williamson, but are considerably longer than broad, some of them oblong-lanceolate, and others hastate, and almost an inch long on large specimens. As indicated in the last edition of Gray's Manual the pinnae are more or less auricled, a feature which is not possessed by *A. viride*, as far as I have been able to learn.

The sori are pretty evenly distributed toward the centre of the pinnae, and extend almost to the apex. The stipe, in the what we may call typical specimens, is usually brown until within a short distance of the apex. In others the brown extends half way or even somewhat less, but there is always considerably more of it than in *A. viride*.

Its relationship, as shown by specimens from this county, suggests a connection which I have never yet heard of from any quarter, but which I think is worth investigating. It seems to stand close to both *A. montanum* and *A. pinnatifidum.* One specimen, nine inches high from the Tucquan, is not easily distinguished from a pinnate form of *A. pinnatifidum*, which is somewhat of a novelty and rather scarce. I am sometimes inclined to think that it is a good variety, if not a species. If it were not for a little frond at the base, which proves beyond a doubt that it is *A. Bradleyi*, I would not know where to place the above-mentioned specimen. Besides the large, as well as some of the small forms, have the tapering projection, which is a feature of both *A. pinnatifidum* and *A. montanum*, and, as with them, is sprinkled with fruit dots to the very end.

One large specimen from McCall's Ferry resembles *A. montanum* very much. At both stations *A. Bradleyi* is associated with *A. montanum* and *A. pinnatifidum.* Are the three found in company at other places?

The dissimilarity in character, both as described in the Manual and by comparison with material at hand, completely debars *A. Bradleyi* from being a variety of *A. viride.* Further exploration of the river hills will undoubtedly bring more of it to light, and there certainly is more of it between this part of Pennsylvania and Kentucky. More specimens from different localities will give us wider views on the subject.

In this connection it may be of interest to state that on November 30th I discovered *Pinus pungens* at McCall's Ferry. It is quite plentiful, and seems to be the prevailing pine.

A. A. HELLER.

LANCASTER, PA., December 7, 1892.

Senecio Robbinsii, Oakes.

BY H. H. RUSBY.

(PLATE CXXXIX.)

Senecio Robbinsii, Oakes, Ms. in Herb. Columb. Coll. *S. aureus*, var *Robbinsii*, A. Gray, in Herb. Columb. Coll. *S. aureus*, var. *lanceolatus*, Oakes, Hovey's Mag. May, 1841, and Thompson's Gazetteer of Vermont; T. & G. Fl. N. A., ii. 492, not *S. lanceolatus*, T. & G. *S. aureus*, var. *Balsamitæ*, T. & G. form of, Gray Syn. Fl. i. part 2, page 391.

From an oblique rhizome, erect, very slender, 2 or 3 feet high, glabrous. Root-leaves 3 to 6, occasionally more, erect on very slender petioles 4′ to 8′ long, the blade 1½′ to 3′ in length by ½′ to 1¼′ in breadth, lance-oblong, acute or obtusish, the base short-cuneate to sub-cordate, sharply and unequally serrate; the cauline sessile and partly clasping, but some apparently petioled by the intervention of a more or less long, naked portion of the mid-rib, serrate above, below laciniate toothed, to distantly lacinately lobed. Heads mostly 8 to 12, on long, sometimes very long, slender peduncles, ⅜′ high; scales lance-linear acutish two-thirds as long as the disk-flowers; akenes linear-oblong, sharply ribbed.

Occurring in wet meadows and bogs along the border of woods or in otherwise partly shaded situations, Northern New England, New York, also in North Carolina. Collected by Robbins at Brownington, Vt.; T. G. White at Franconia, N. H.; Mrs. Clark and Dr. Britton, near Mt. Marcy, in the Adirondacks; Rusby and others at Willoughby, Vt.; and by Messrs. Small and Heller on Roan Mountain, North Carolina.

It is a little strange that this fine species of *Senecio* has so long escaped publication as a species. It is probably due to the fact that the comparatively few botanists of the past generation who have dared say what they thought, never saw it in a growing state. In the herbarium it is not difficult to mistake it for *S. aureus*, but not so when seen growing. During the past season it was almost simultaneously discovered by Dr. Britton and myself, and each of us at once resolved to describe it as a species. Mr. Oakes, who first described it from Robbins' specimen as a variety, had a strong feeling that it was distinct, and wrote on the label, "If this is a new species I should be glad to have it called S. Robbinsii." Out of deference to Mr. Oakes, I give him credit for the species. Upon the same sheet, Dr. Gray writes, "S. aureus, var. Robbinsii (An Sp. Nov.?)," but in later years, misled by its great resemblance to *S. aureus*, he assigns it to a very insignificant position.

Botanical Notes.

A Century of Weed Seeds.—Professor Byron D. Halsted, of the New Jersey Agricultural Experiment Station, New Brunswick, has supplemented his distributed sets of 100 American weeds by sets of their seeds. They are arranged in vials with printed labels, placed in a tray about the size of an herbarium sheet. Botanists generally should be interested in this collection, prepared especially for use at the Agricultural Experiment Stations, where it will prove invaluable in the determination of seeds. A few sets of the collection may be had from Professor Halsted at $10 each.

In my note on Polypodium vulgare var. Cambricum, in the September BULLETIN, I stated that it was its first recorded station in America. In this I was in error, as Dr. T. J. W. Burgess had already noted in 1886 (Trans. Royal Soc. Canada, iv., 10), the finding of this variety at Port Simpson, British Columbia, near the southern extremity of Alaska. I had entirely overlooked this reference, although Dr. Burgess had kindly sent me a copy of his paper when published. LUCIEN M. UNDERWOOD.

GREENCASTLE, IND., October 31, 1892.

Sur la Conservation des Herbiers.—Alfred Chabert (Bull. Soc. Bot. France, xiv., 156). Various more or less laborious methods for the preservation of plants in herbaria are discussed at length. Among others it is noted that paper manufactured solely of vegetable matter and unbleached, notably that made of wood fibre is especially valuable for preventing the ravages of insects, though it is neither as white nor as smooth as might be wished for. It is suggested that it might be desirable to use alum in the manufacture of herbarium paper as a preventative of insect life. The author concludes, however, that one of the most efficacious, least expensive and least time-consuming of processes for the complete extermination of herbarium pests is a semi-yearly fumigation with sulphur. A. M. V.

Pink Water Lilies.—An interesting fact concerning *Castalia odorata*, f. *rosea* (Pursh.) Britt., has just been brought to my notice. On a plat of low bottom land near Buffalo, Putnam Co., W. Va., the plough turns up a large number of small tubers each season that the soil is cultivated. These planted in tubs produce, much to the astonishment of the neighborhood, beautiful deep-pink water-lilies. How long this bottom has been drained is not known, but the evidence adduced by the fact above stated of the existence of a pond here, certainly over a century ago, is very interesting; as is also the light thrown upon the distribution of this pretty form of the water-lily. C. F. MILLSPAUGH.

Notes on Scabiosa australis and Reseda alba. Referring to Mr. Redfield's note in the BULLETIN regarding *Scabiosa australis*, Wulf., I think it may be of interest to report an additional station for it. I found it September 27, 1889, at Lisle, Broome county, N. Y., perhaps twenty or thirty rods south of the D. L. &. W. Station, on the east side of the track, on the railroad ground, where it was well established, having taken entire possession of the ground for several rods, and in two or three different patches. I have noticed it several times since as I was passing on the train, the last time being only three weeks ago, and it seems to be still spreading. On the date above mentioned I sent some of it to Dr. Watson, and under date of September 30th he writes: "It is naturalized in several places in central New York and Pennsylvania and perhaps should go into the Manual." I have thought sometimes that my calling attention to it just before the issuing of the Manual was the reason it appeared in the appendix.

I found in June, 1890, *Reseda alba*, L., growing by the side of the street in Youngstown, O. As it is not a plant that any one would cultivate for either its beauty or its fragrance, I could not consider it an escape from a garden, and wondered how it got there. There were a dozen or more plants, but I have not had opportunity since to learn if it persists in the same place or not; I will try and learn next summer. Has it been reported before?

R. H. INGHAM.

NILES, OHIO, NOV. 24, 1892.

[*Reseda alba*, L. is reported in Mr. David F. Day's Catalogue of the Plants of Buffalo, N. Y., as "spontaneous in gardens and escaping."—ED.]

Proceedings of the Club.

WEDNESDAY, NOVEMBER 30TH, 1892.

The President in the chair and thirty-six persons present.

Dr. Britton reported a communication from E. W. McCabe to the effect that the late Miss Phœbe McCabe had expressed a wish that upon her death her herbarium should pass into the possession of the Club, for which she had always entertained a deep regard. Dr. Britton remarked upon the energy with which she had collected the flora of the region about White Plains, N. Y. It was unanimously resolved to accept the collection.

The following were elected active members: Miss Emma J. Thompson, Dr. O. G. Harrison, Mr. C. C. Curtiss, Miss Effie A. Southworth, Miss Jean K. Howell, Miss Theresa Gertrude Williamson, Miss Helen M. Ingersoll and Mr. Frank A. Pollard.

The first paper of the evening, entitled "The Flora of Willoughby Lake and Mountain," was then read by Dr. Rusby. The paper was illustrated by a number of lantern views.

The President remarked that the paper was very interesting in its reference to new forms. Dr. Britton said that the reference to *Campanula rotundifolia* recalled his observations in New York and elsewhere that this species grew not alone on rocky banks, but in meadows. Dr. Rusby replied that this was true to a limited extent at Willoughby, and that the banks upon which it grew were themselves grassy. Miss Kellogg confirmed this statement. Mrs. Britton stated that along the Intercolonial Railway in Nova Scotia she had noticed plants three feet high growing in thick grass.

The second paper, entitled "The Seeds of Some Native Orchids," illustrated by drawings and microscope slides, was then read by Mr. Carlton C. Curtiss.

TUESDAY, DECEMBER 13, 1892.

Dr. Brtiton announced to the Club the death of Dr. John S. Newberry, for many years president of the Club, which took place on December 7th, after a prolonged illness. Dr. Britton remarked on the invaluable services rendered to botanical science by Dr. Newberry. A committee consisting of the president, Dr. Allen and Dr Britton was appointed to prepare an account of his life and works for publication in the BULLETIN.

Miss Helen Desmond Nelson was elected an active member and Prof. George B. Aiton, of Minneapolis, Minn., a corresponding member.

Reading of communications followed, the first being a paper by Dr. Emily L. Gregory, entitled. "Notes on *Riccia*." Some valuable additions were made to our knowledge of the history of

R. natans. The paper was illustrated by blackboard drawings and by specimens preserved in alcohol.

The second paper was then read by Dr. N. L. Britton and was entitled, "Notes on some Interesting Plants of the Adirondack Mountains," illustrated by copious specimens. The president remarked upon the evidence presented by this paper of the great importance of carefully exploring well-known localities. Every such exploration, of which an account has been presented to the Club, had resulted in bringing to light new facts of importance. Dr. Britton then read a short paper "On *Rusbya*, a new Genus of Vacciniaceæ from Bolivia." The paper was illustrated by specimens of two species, as well as by a number of other interesting members of this family from the same region. Special interest centered in the question as to whether these plants were really parasitical or not. Dr. Rusby was called upon for some remarks, and expressed the opinion that they were, at most, only partially parasitic. As he had observed these plants growing in the Bolivian Andes, it seemed to him that the group presented indications of being but the remains of a very large group which had formerly existed. Species in the several genera were in a number of cases solitary or few, and other cases showed broad gaps. He had a number of new species and probably a new genus waiting to be described.

WEDNESDAY, DECEMBER 28, 1892.

The president in the chair and nineteen persons present.

Dr. Britton exhibited a large work in two volumes on "Seedlings" by Sir John Lubbock, and remarked upon the importance of the subject and the value of the book.

Miss May Bristol was elected an active member.

The announcement paper of the evening, on "Hostile Bacteria," was then read by Prof. H. W. Conn, of Wesleyan University.

Recent Literature Relating to American Botany.

Additions to the Cretaceous Flora of Staten Island. Arthur Hollick. (Proc. Nat. Sci. Assoc. Staten Island, November, 1892.)

Additions to the Flora of the Cape Region of Baja California. T. S. Brandegee. (Proc. Calif. Acad. Sci. (II.) iii. 218, reprint.

Four species are described as new: *Dalea trochilina*, *Acacia Californica*, *Albizzia accidentalis* and *Dianthera incerta*.

A Double Morning Glory. (Gard. and For. v. 592.) With illustration of double flowers of *Ipomœa purpurea.*

Araceen Brasiliens—Die Nutzbaren und Officinellen—Theodor Peckholt. (Pharm. Rundsch. x. 279.)

Aster and Solidago—Development of the Flower and Embryo-Sac in. G. W. Martin. (Bot. Gaz. xvii. 406; with plates.)

Aster and Solidago—Development of the Floral Organs in. George Martin. (Am. Nat. xxvi. 1032.)

Botanical Notes from Texas. E. N. Plank. (Gard. and For. v. 579.)

Celastrus scandens. (Gard. and For. v. 568) With plate.

Cross Fertilization—Insects attracted by fragrance or brillancy of flowers for purposes of. Richard E. Kunze. (Canad. Entom. 1892; reprint.)

Diatomology. K. M. Cunningham. (Am. Micros. Journ. xiii. 249.)

Diatoms of the Connecticut Shore. W. A. Terry. (Am. Micros. Journ. xiii. 253.)

Die "Springenden Bohnen" aus Mexico—Dritter Beitrag. Franz Buchenau. (Abh. Natur. Ver. Bremen, xii. 577–290.)

Herr Buchenau reviews the whole subject of Mexican "Jumping Beans," holding that *Sebastiana Palmeri*, Rose, the seeds of which contain the larva of *Carpocapsa saltitans* is the same as *S. Pavoniana* Müll. Arg., and that similar seeds are produced by *Colliguaja Brasiliensis* in the Argentine Republic, the "jumping" of these being caused by the larva of another moth, the *Grapholitha motrix.*

Dionæa muscipula, Ellis—Contributions to the History of. J. M. MacFarlane (Contr. Bot. Lab. Univ. Penn. i. 7. illustrated.)

Dr. MacFarlane gives in summary the results of a number of years' experiments upon the plants irrito-contractility. The closure of the leaf is discussed as dependent upon stimuli of mechanical, thermal, luminous, chemical and electrical nature. Experiments show that mechanical stimuli are especially interesting, and demonstrate the peculiar sensitivity of the leaf to a series of irritations, rather than, as generally stated, to the first impulse. A record is given of the plants memory of impulses, and of its memory-duration under varying temperature. A second series of experiments show that closure is not altogether dependent upon irritation of the sensitive hairs, the outer as well as the inner surface of the leaf proving sensitive, but in a less degree. Structurally, the author has especially considered the irritable hairs, and the questions of inter-cellular passages, and of inter-cellular protoplasmic connections. The origin of the contractile impulse is centralized in the joint of the irritable hairs; here a first mechanical impulse coralizes the protoplasmic elements and arranges minute permeable areas in the contained sap,—a second stimulus beginning the process of squeezing out liquid into the permeable areas, and perhaps as well through the hair-joint cells. The discovery of transverse striæ in the cell protoplasm suggests interesting structural relations with striped muscle. The author emphasizes, especially, the important functions of inter-cellular protoplasmic connection and the minor importance of cellulose extensibility. "* * The cellulose membranes are merely secondary strengthening sacs, that act much like the netting bags that surround rubber bellows. * * That contractility, alike in the animal and vegetable kingdoms is accomplished by migration of liquids through the protoplasmic substance, and that this is wholly determined by the molecular condition of the plotoplasm, irrespective of cell walls." The utilization of starch during the process of contraction and secretion is also considered. Experiments in regard to secretion demonstrate that any protoplasmic irritation (including electrical) will cause the outpouring of the digestive juices, a process that becomes as apparently continuous as if a nitrogenous body had been the cause of its excitation. The paper closes with some suggestive notes as to the evolution of the mechanism of *Dionaca*.

BASHFORD DEAN.

Dionæa—An Abnormal Development of the Inflorescence of. John W. Harshberger (Contr. Bot. Lab. Univ. Penn. i. 46, illustrated.

Distribution of the Flora of the Cape Region of Baja California. T. S. Brandegee (Zoe, iii. 223–231).

Epilobium—A New. T. S. Brandegee (Zoe, iii. 242, 243, with plate). Description and figure of *E. niveum* from Snow Mountain, Lake Co., Cal.

Ferns—Synoptical List—xiii. G. S. Jewman (Bull. Bot. Depart. Jamaica, Oct., 1892). Notes on *Hypolepis Purdiana*, *H. repens*, *H. nigrescens*, *Notholæna trichomanoides*, and *N. ferruginea.*

Flora Washingtoniensis. Wilhelm W. Suksdorf (White Salmon, Washington, 1892). A catalogue of the Phænogamia and Pteridophyta of Washington.

Grass of Parnassus (Am. Gard. xiii. 696). Illustration of *Parnassia palustris.*

Leersia—The Genus. Theo. Holm (Bot. Gaz. xvii. 358, reprint, illustrated).

List of Plants collected by C. S. Sheldon and M. A. Carleton in Indian Territory in 1891. J. M. Holzinger (Contr. U. S. Nat. Herb. i. 189). Two new species, *Ipomœa Carletoni* and *Euphorbia strictior*, are described and illustrated.

Nomenclature of Plants. Katharine Brandegee (Zoe, iii. 258–261).

Notes on Collections of Cryptogams from the higher mountains of New England. William G. Farlow (Proc. Bost. Soc. Nat. Hist. xxv. 387).

Notes on the Geology of Skunnemunk Mountain, Orange County, New York. Chas. S. Prosser (Trans. N. Y., Acad. Sci. xi. 132–149).

By far the larger part of this paper is occupied by accounts of the fossil plants found in the rocks of this locallty, by means of which the age has been provisionally determined as Middle Devonian. *Psilophyton princeps*, Daw., was particulary abundant.

Observations on the Plants of Oklahoma Territory and Adjacent Districts. M. A. Carleton (Contr. U. S. Nat. Herb. i. 220).

Œnothera—Notes on Some Species of the Genus. Alice Eastwood (Zoe, iii. 248–252).

On the Myxobacteriaceæ a New Order of Schizomycetes.—Roland Thaxter. (Bot. Gaz. xvii. 389, illustrated).

Two new species of *Chondromyces* are described and illustrated. The genus *Myxobacter* is established with one species *M. aureus.*

The genus *Myxococcus* is also established with three species, *M. rubescens*, *M. virescens*, and *M. coralloides*.

Paleontologie Vegetale. (*Ouvrages publies en 1890.*)—R. Zeiller. (Extrait de l'Annuaire Geologique Universel, vii. 1115-1157).

This is a summary, with comments, upon most of the important publications concerning fossil botany which appeared during the year 1890. America is well represented by the works of Ward, Dawson, Matthew, Fontaine, Knowlton, Holm and others, most of which were here noted at the time of publication.

Pavonia Wrightii. (Meehan's Month. ii. 178).

Pflanzenpathologische Mittheilungen aus Ecuador. G. de Lagerheim. (Zeitsch. Pflanzen. Krank., ii. 195).

Prunus tomentosa. J. G. Jack (Gard. and For. v. 580, with illustration).

Rumfordia from Lower California—A new. T. S. Brandegee (Zoe, iii. 241, 242, with plate).

Discription and figure of *Rumfordia connata.*

Sullivantia Hapemani. J. M. Coulter (Bot. Gaz. xvii, 420).

Tabebuia Donnell-Smithii. J. N. Rose (Bot. Gaz. xvii. 418).

A new species from Mexico and Central America, with one of C. E. Faxon's beautiful plates.

Taxodium mucronatum (Gard. Chron. xii. 646).

With illustration of the famous old Mexican Deciduous Cypress at Sta. Maria del Tulé.

The Occasional Cross. Th. Meehan (Bot. Gaz. xvii. 420).

Trees in Winter. E. P. Powell (Am. Gard. xiii. 706, illustrated).

Two Pretty Pentstemons. F. A. Waugh (Am. Gard. xiii. 724).

Illustrations of *Pentstemon cristatus* and *P. confertus.*

Vegetable Pathology. Report of the Chief of the Division of. (U. S. Depart. Agric., 1892). With illustrations of *Ceratocystis fimbriata.*

Vine Cactus in Mexico—The. (Am. Gard. xiii. 759). Illustration of *Fouquiera splendens.*

Washingtonia filifera. (Gardn. Chron. xii. 590, 677, illustrated).

Weeping Spruce—The. Thomas H. Douglas (Gard. and For. v. 591). With illustration of *Picea Breweriana.*

Wistaria Sinensis—The. Anatomy of the Stem of. Carlton C. Curtiss (Journ. N. Y. Micros. Soc. viii. 79–89; three plates. Reprinted as Contrib. Herb. Col. Coll. No. 28).

Mr. Curtiss describes at length the anatomy of the stem of this vine, with especial reference to the secondary layers of bast which are formed in the growth of old stems at intervals of several years and become covered by the succeeding layers of wood. The material which called especial attention to these studies was received some time ago from Mr. B. Heritage, of Mickleton, N. J.

Reviews of Foreign Literature.

Fossil Plants as Tests of Climate. A. C. Seward. (Pamph. 8vo., pp. 151; Cambridge Univ. Press, London, 1892. New York, Macmillan & Co.) This is the Sedgwick prize essay for the year 1892, and in it the author has endeavored "to consider plants as the thermometers of the past," in which effort he has succeeded in bringing together practically all important references by botanical and geological writers on the subject. Plants in spite of their meagre palæontological remains, as compared with animals, have always been considered as the more trustworthy indices of climatal changes, as they are unable to migrate with the same ease as animals in the event of a change in temperature. They must either perish entirely or else gradually adapt themselves to the changed environment.

An introduction and historical sketch precedes the subject matter proper, after which follow chapters on plant distribution, Arctic vegetation, influence of external conditions upon the macroscopic and microscopic structures of plants, annual rings in recent and fossil plants, Arctic fossil plants, Carboniferous Period, Pleistocene plants and concluding remarks.

The principal question to be solved has always been whether the evidence warranted the assumption of a uniform climate throughout the world in past geological ages or whether there were temperature zones as we recognize them to-day. The general broad view of the subject undoubtedly indicates a uniform temperature until as late as Tertiary times, but several minor facts have recently received attention which would seem to qualify any such general conclusion. The geologists, for instance, insist upon the evidence of the existence of an ice age during the Carboniferous Period, and the present distribution of our alpine and boreal plants prove to be a stumbling block every now and then to those who think that they have reached definite conclusions in regard to plant life and the conditions surrounding it just prior to the Glacial Epoch. In regard to this latter part of the subject—plant distribution—the botanist, has something to learn from the geologist and vice versa, and several errors might have been spared each had they recognized this fact. The subject is one which has received more or less attention lately, and is sure to receive consideration for some time to come, and we earnestly commend some of the references here given to the careful consideration of all who are interested in such discussion.

As a useful compend of diverse views the work is invaluable, and the exhaustive bibliography which is appended will save future students an immense amount of labor. This wealth of reference is confusing, however, especially as the author contributes nothing new in the line of original investigations or conclusions, and the reader is inclined to lay down the work finally with the impression that there is a hopeless disagreement between authorities on the subject of past climatal conditions on the earth as evidenced by plant remains. A. H.

Ueeber Boehmische Kreidepflanzen. Hermann Engelhardt. (Naturforsch. Gesellsch. d. Osterlandes, Neue Folge, Band v. 86–118 Taf. I.)

This supplements in a pleasing manner Velenovsky's work in the same horizon, and adds not a little to our knowledge of the universal vegetation which flourished throughout the world in Cretaceous times. Many species identical with those from the Western Continent may be noted, and the author describes and figures as new *Sphaeroccites Laubei*, *Litsaea Bohemica*, *Callistemophyllum Bouderi*, *Sterculia* sp. (allied to *S. aperta*, Lesqx.) and *Pinus* sp. A. H.

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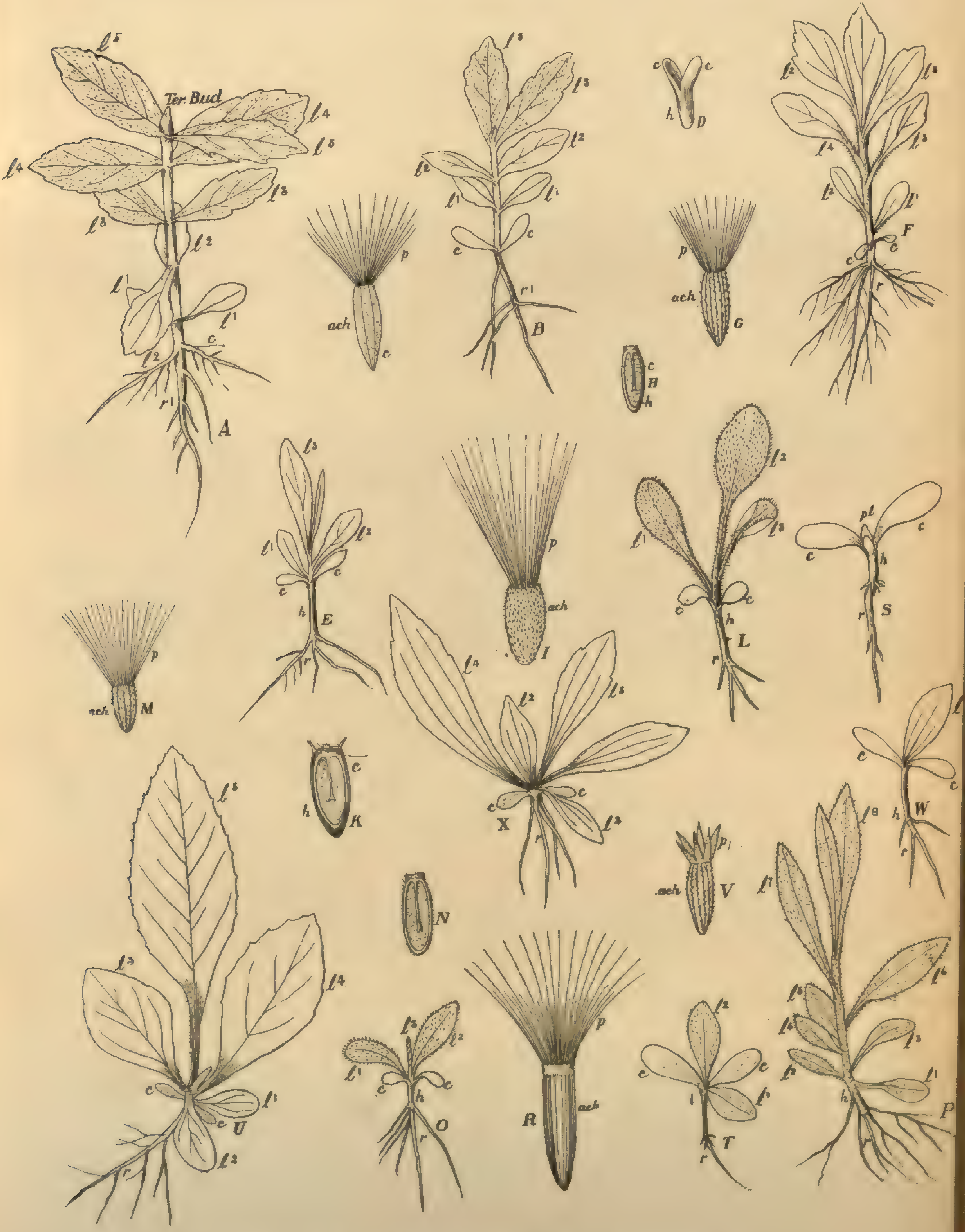
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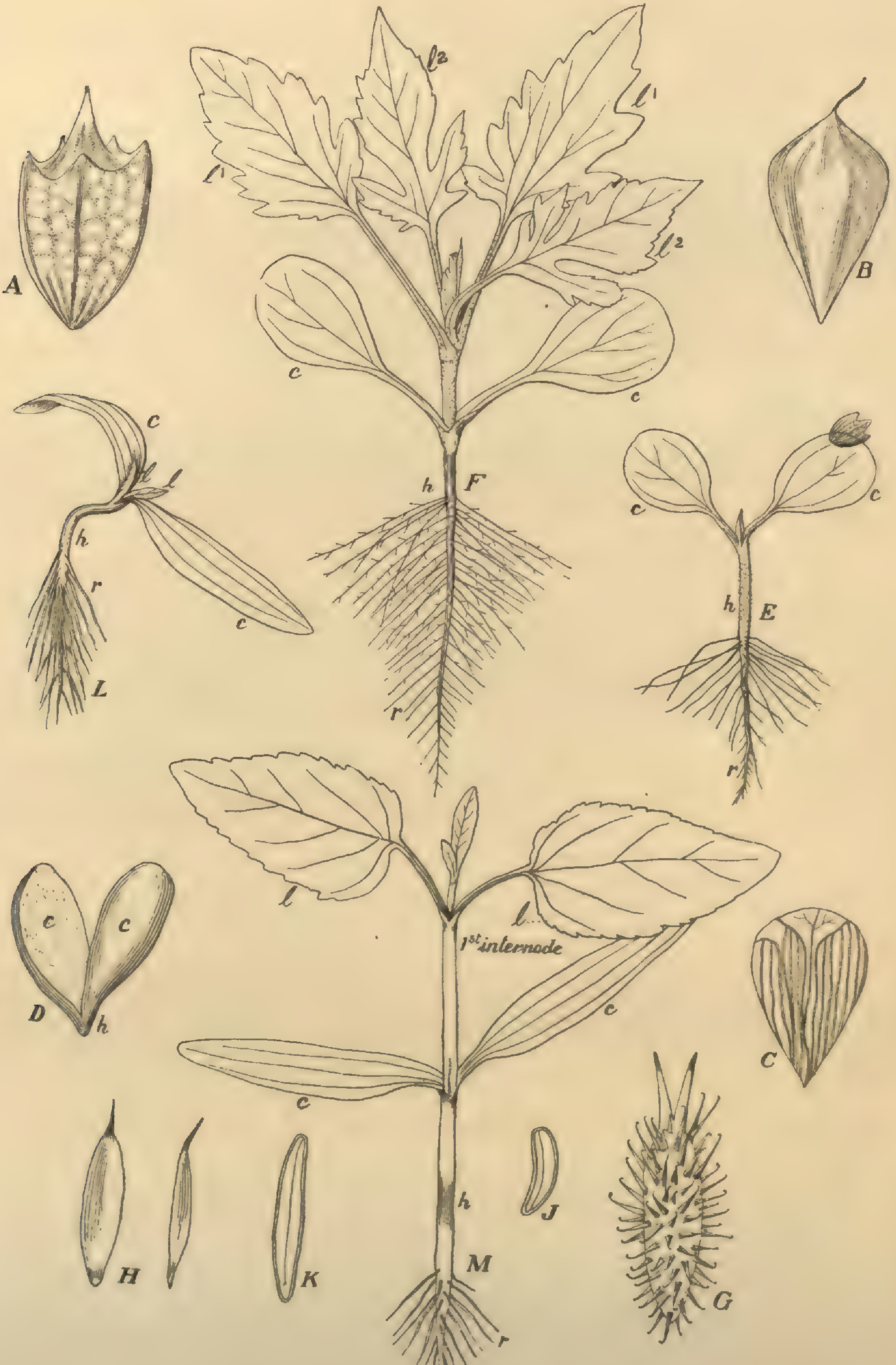
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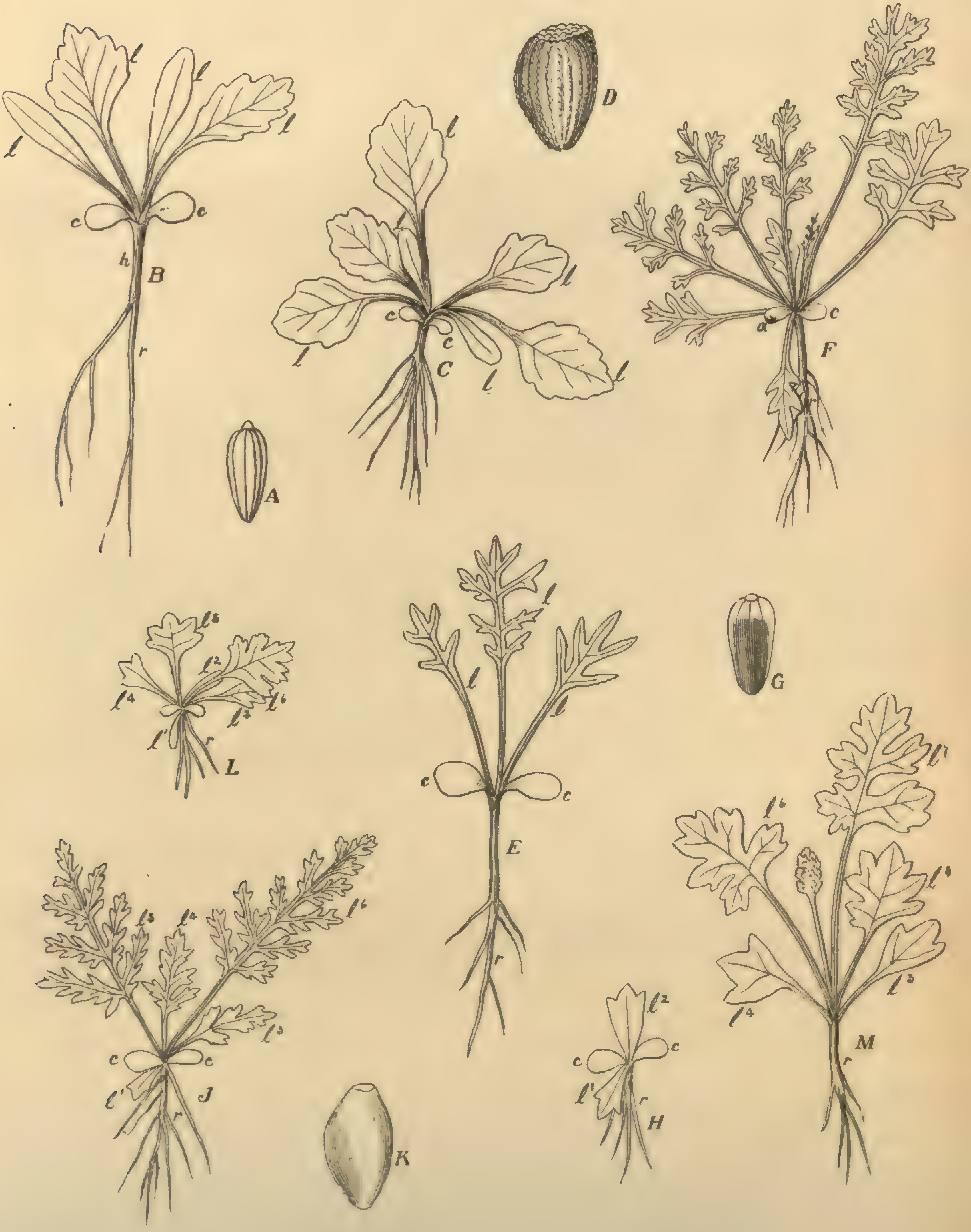
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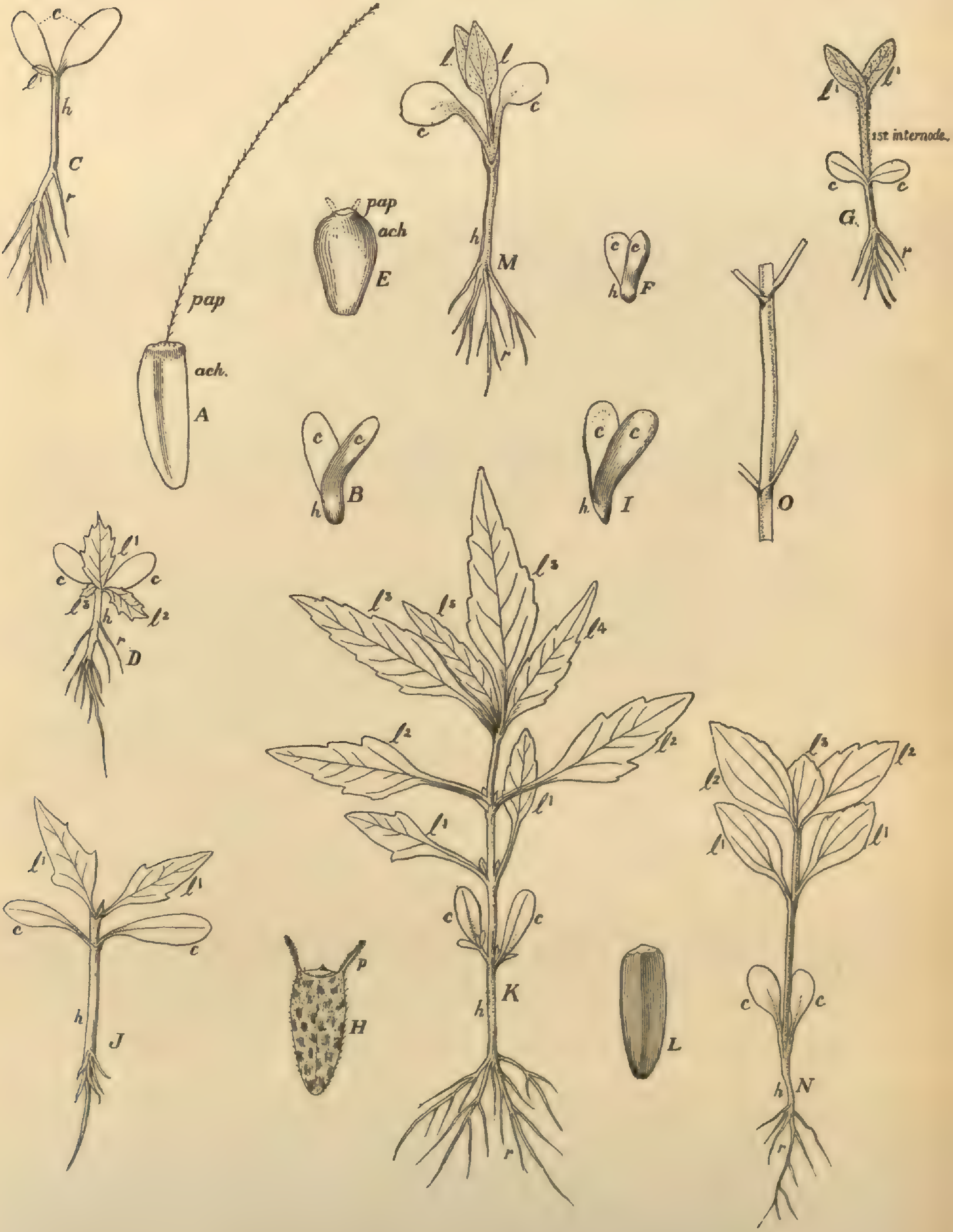
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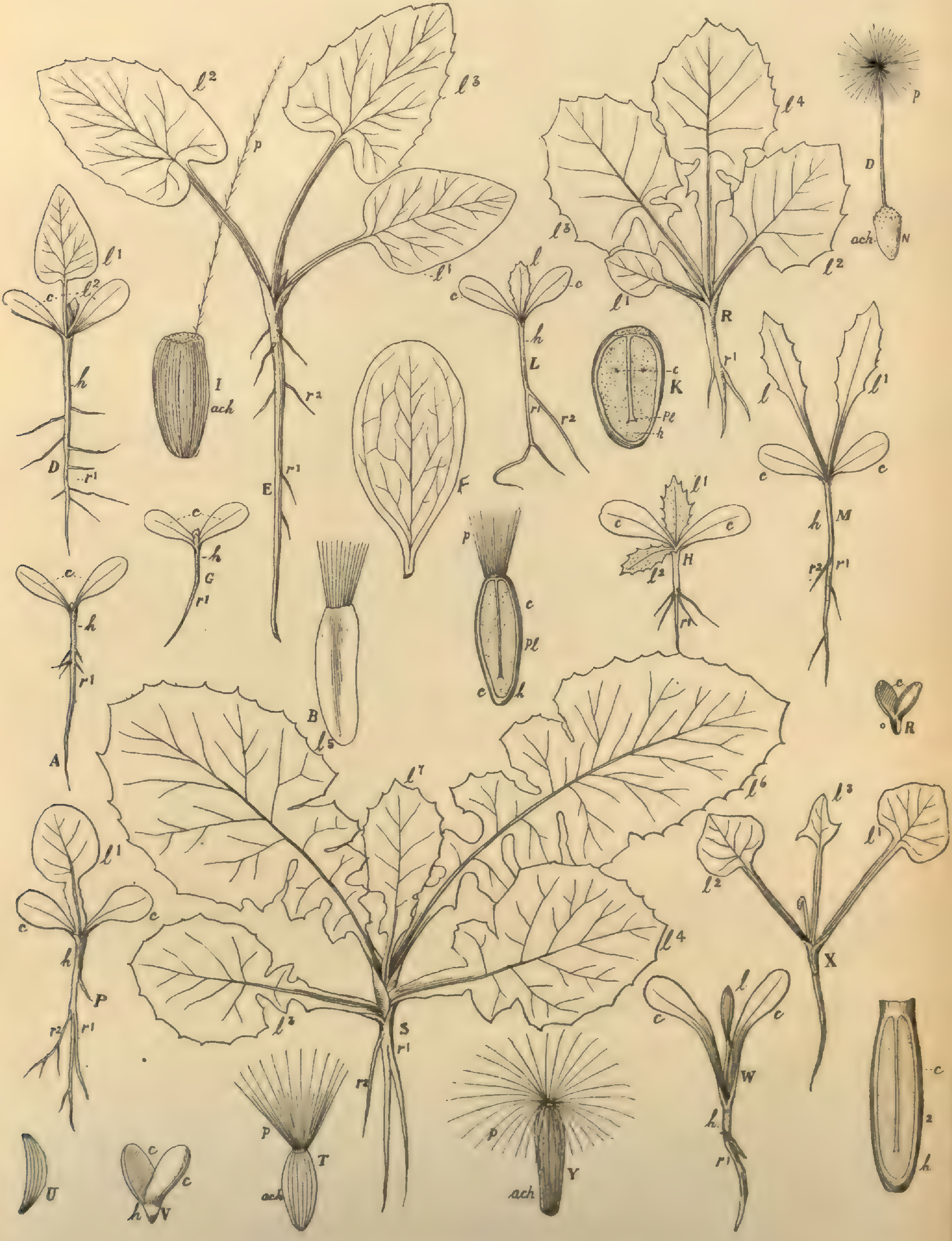
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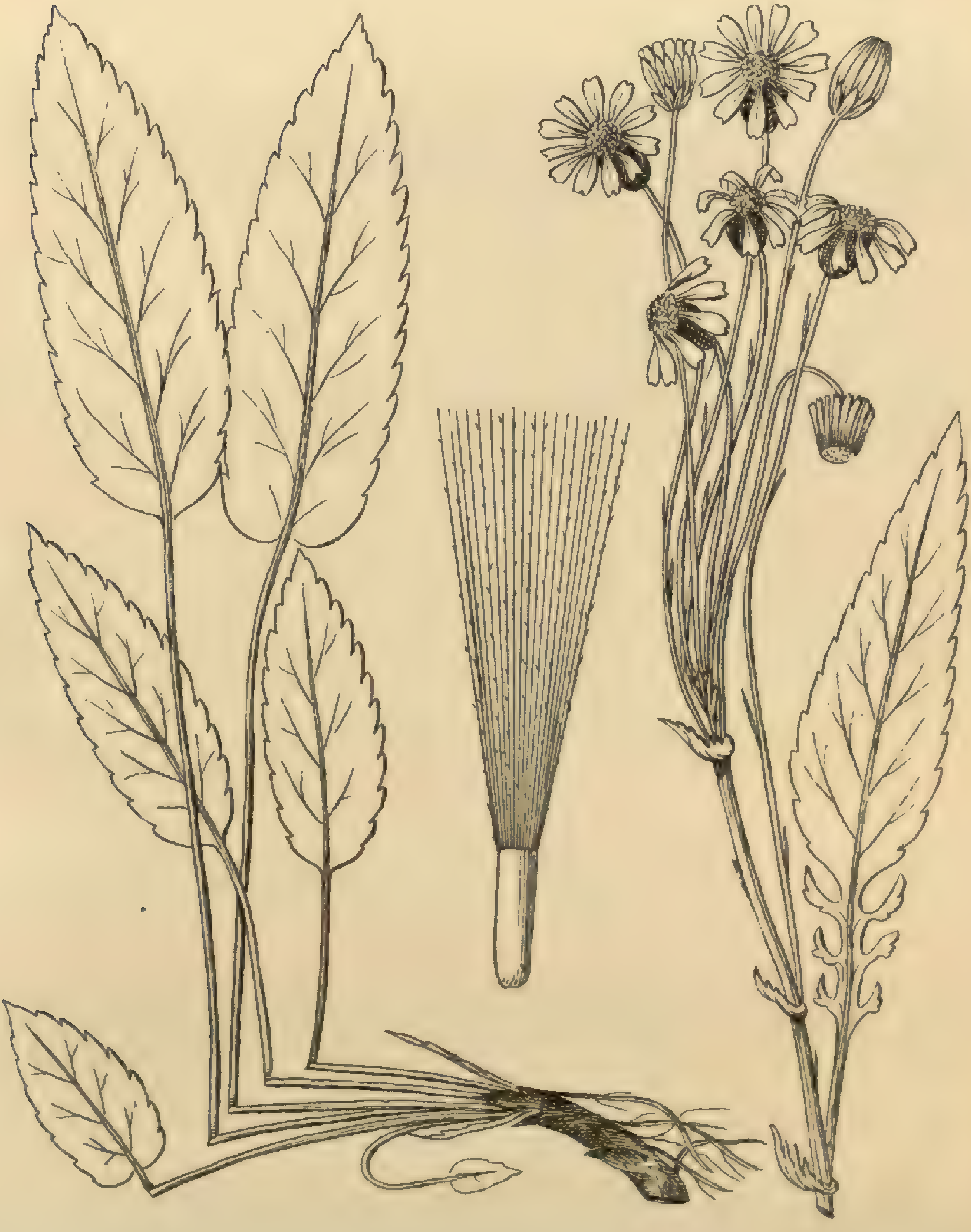

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The Club meets regularly at Columbia College, 49th Street and Madison Avenue, New York City, on the second Tuesday and last Wednesday of each month, except July, August and September, at 8 o'clock, P. M. Botanists are cordially invited to attend.

MEMBERS OF THE CLUB will please remit their annual dues for 1893, now payable, to Mr. Henry Ogden, Treasurer, 11 Pine St., New York City.

BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XX. New York City and Lancaster, Pa., February 15, 1893. No. 2.

A new Species of Listera, with Notes on other Orchids.

By Thomas Morong.

Listera borealis, n. sp.—Stems very delicate, 3′-5′ high, glabrous below, glandular pubescent and with long, silky, scattered hairs among the inflorescence, sheathed by 2 obtuse, membranous scales at the base; roots thickened, somewhat fleshy; leaves oval, slightly sheathing, obtuse at the apex, 4″-8″ long, 2″-4″ broad, entire, bearing on the surface a few silky hairs, otherwise very glabrous. Raceme 2 or 3 flowered. Bracts scarcely 1″ long, much shorter than the pedicels. Sepals and petals nearly equal, linear, obtuse, about 2″ long. Lip 4″-5″ long, 2″ broad at the obtuse apex, ciliolate above; apical lobes very obtuse, 1″ long, the intermediate tooth obsolete; basal lobes ½″ long, very obtuse. Column slightly incurved, 1½″ long. Flowers greenish-yellow, the lip with a purplish middle, and purplish nerves radiating into the apical lobes. The flowers and column, as well as the leaves and upper stem bear the silky hairs mentioned, some of which are 2″ long.

Collected by Miss E. Taylor at Fort Smith, Slave River, Hudson Bay Territory, June 28, 1892.

Self-fertilization.

Darwin seems inclined to think, if he does not absolutely assert, that all orchids are unable to fertilize themselves, and that appears to be the prevalent view to-day. That insect agency is imperatively needed in many cases is doubtless true. The structure of the floral organs in a large number of species is such that it is clearly impossible for the pollen to reach its own stigma without artificial aid. The rostellum often very effectually interposes between the anther cells and the stigmatic cavity. There is, however, more than one species in which the means of self-fertilization are provided, and plenty of proof that this does take place. The plants have two strings to their bow, and one or both may be used as a means of securing offspring, as in many *Naiadaceæ* both propagating buds and seeds are produced, so that if one method fails the other may be employed. It is not always true that the pollen is so firmly agglutinated that its grains can be separated only by a considerable force. In *Leptorchis*, for instance, the pollen masses are very loosely granular, without caudicles, glands or connecting threads, and the grains are easily detached by the wind or rain, and therefore liable to be conveyed to their own stigma by such agitation. What serves to show that in this genus self-fertilization is common is the fact that our two species produce an abundance of ripe capsules which is not generally true in other genera where insect agency is absolutely necessary. *L. liliifolia* frequently occurs in our Northern woods and nearly every plant that I have collected in the latter part of the season is well furnished with fruit. This is equally the case with the several species of *Achroanthes.* In several of the genera which are destitute of caudicles and glands, I have had occasion to observe the pollen dust scattered over the lip, column and stigma precisely as I have seen the pollen of willows scattered over the inflorescence, suggesting an analogous distribution. Another very interesting method of self-fertilization is related by Sir Jos. Hooker in a paper which he read before the Royal Society of London, in 1854. The plant which he has under review, is *Listera ovata*, a British species very like our *L. cordata*. He found that if the rostellum is touched or irritated when the pollen is ripe a sort of explosion occurs and two white viscid masses are instantly protruded, one from each side of the apex, which coalesce and attach themselves to the bases of the pollinia, and draw them out of their cases. The pollen, he says, is by this means broken up, and the grains fall over the edge of the rostellum upon the stigmatic surface. Here is a case which, while not at all preventing the plant from being fertilized in the ordinary way by insects, clearly shows that the means of self-fertilization is specially provided for. Now in the allied genera, *Gyrostachys*, *Peramium*, *Epipactis*, *Cathea*, *Arethusa* and *Pogonia*, while no irritability of this kind has so far been observed, yet the caudicular discs are attached so firmly to the back of the rostellum that by bending it downwards the pollinia are drawn out of their cases and broken up. Supposing an insect crawling upon the rostellum or any other weight to perform this act, some of the pollen grains are pretty sure to be thrown upon their own stigmas. In the three first mentioned of these genera, at least, we find the species maturing an abundance of fruit, which in a measure confirms the idea that self-fertilization often takes place. But there is stronger evidence of the fact of self-fertilization in several species of *Habenaria.* In *H. tridentata,* the rostellum, instead of being as in most species of *Habenaria,* a solid shield interposing between the anther cells and a deep stigmatic cavity lying far underneath, is split into three club-shaped columns, standing one on each side of the cells and one between them, rising to a level with the cells. The upper and inner surfaces of the two lateral columns are viscid and evidently stigmatic. The pollen is powdery and within easy reach of these contiguous stigmas. Curiously enough, too, when the anther cells dehisce, these stigmatic columns contract on their inner side, and may be said actually to lean over and help themselves to the pollen. As a matter of fact the columns are known often to be penetrated even in the unopened flower by pollen tubes (Gray's Man. Ed. 6, page 506), and they have been found still more common in the mature flower. This structure occurs to a greater or less degree in the allied species, *H. integra* and *H. nivea.* With such facts as these before us, we should be cautious how we limit all Orchidaceous species to a single mode of fertilization.

Nomenclature.

Calopogon, R. Br. in Ait. Hort. Kew. Ed. 2, v. 204 (1813).

This name is antedated by *Cathea,* Salisbury in Trans. Hort. Soc. i. 300 (1812), and by *Limodorum,* L. Gen. Pl. Ed. 2, 829 (1742), as well as by *Helleborine,* Martyn (1736). Kuntze, Revisio Generum Plantarum, 665, adopts the last name as having the right of priority, but, taking as our starting point in nomenclature, the first edition of Linnæus' Species Plantarum, 1753, we cannot follow him. *Limodorum* must be dropped also, because Ludwig (Definitiones Generum Plantarum, 1737) had anticipated the Linnæan name of 1742 by adopting *Limodorum* from Tournefort, in application to a different genus from that of Linnæus. Therefore, we must drop both *Calopogon* and *Limodorum* and apply Salisbury's name to the Northern species, which will accordingly stand as follows:

CATHEA TUBEROSA (L).

Limodorum tuberosum, L. Sp. Pl. 950 (1753).

Cathea pulchella. Salisb. Trans. Hort. Soc. i. 300 (1812).

Calopogon pulchellus, R. Br. in Ait. Hort. Kew. Ed. 2, v., 204 (1813), and later authors.

Listera, R. Br.—Kuntze has adopted Rafinesque's name "*Diphyllum*" as anterior to *Listera*. The word originally misspelled "*Diphryllum*," and several times subsequently in Rafinesque's published writings, Kuntze seems to think should be retained in this form on that account, but Rafinesque himself spells it correctly in his "*Herbarium Rafinesquianum*," and there seems to be no good reason why an evident misspelling should not be corrected. It is, however, inadmissible as a substitute for *Listera*, as the description given by Rafinesque in Rep. N. Y. Med. Repos., 2nd Hexade v., 357, (1808), clearly shows. He speakes of his plant as having "2 interior petals . . . bifid; lip acute, *entire*; *capsule filiform*," which is entirely inapplicable to any of our published species. There is preserved in the library of the New York Academy of Science a curious old volume of proof plates of various species drawn by Rafinesque, among which is a drawing of this plant, the figure of which corresponds exactly to the author's description. What plant was meant it is impossible to say, but it is evidently not a species of our *Listera*. Consequently the name of Brown holds good.

Spiranthes, Richard, 1818, must give way to *Gyrostachys* of Persoon, 1807, as has been well shown by Kuntze, and our species known as *Spiranthes* should be classed under the older name.

Probably Kuntze is also correct in displacing *Liparis*, Richard 1818, by *Leptorchis*, Du Petit-Thouars, 1809, but I have not been able to get hold of the work cited by Kuntze (Nouv. Bull. Soc. Phil. 314-19) and cannot verify his date.

Goodyera R. Br. (1813) is antedated by *Orchiodes*, Siegesbeck, 1737 (Supp. 13) and by *Peramium* of Salisbury (Trans. Hort. Soc. i. 301) 1812. Under our rules *Peramium* must be substituted for *Goodyera*.

Epipactis.—The history of this name is a curious one, showing how tangled is the synonymy when we come to search for priority. Kuntze in the volume already referred to cites Ludwig's name *Limodorum* as the original under his system of nomenclature, but that acute author has made a palpable mistake, for Ludwig adopts the name from Tournefort and a reference to Tournefort's description and figure shows very clearly that he means a spurred plant belonging to the genus *Orchis*, and Ludwig himself (Def. Gen. Pl. Ed 2, 213) describes it as having a spur, which *Epipactis* has not. Linnæus in his description of *Orchis*, Gen. Pl. n. 681, correctly cites Tournefort's *Limodorum* as the same as his *Orchis*. Linnæus' *Scrapias* (Gen. Pl. n. 683), which equals *Helleborine*, Tournefort, included several genera, among them our *Epipactis*, the original name being retained by Bentham and Hooker for several Mediterranean species. Haller in 1742 (Enum. Stirp. i. 277) constituted the genus *Epipactis*, followed by Crantz in 1769, Allioni in 1785, and others. Richard afterwards still farther divided the genus, calling the plants without glands *Cephalanthera*. So that we have the three genera, *Scrapias*, *Epipactis* and *Cephalanthera*, each of them legitimately applied to the species now bearing those names.

The species of *Epipactis* occurring in Northeastern North America, should be designated as follows:

E. VIRIDIFLORA (Hoff.)

Scrapias viridiflora, Hoff. Deutsch. Fl. ii. 182 (1800).
E. latifolia, var. *viridiflora*, Irm. in Linnæa xvi., 451 (1842).
E. virdiflora, Reich. Fl. Exc. 134 (1830).
E. Helleborine, var. *viridens*, Asa Gray, Bot. Gaz. iv. 206 (1879).
E. Helleborine, A. Gray, Man. Ed. 6, 504, (1890) not Crantz.

Dr. Gray in the volume of the Botanical Gazette referred to, noticing the recent discovery of the plant at Syracuse, New York, states that it is "exactly the *E. viridiflora* of Reichenbach, well figured in the Icones Floræ Germanicæ which peculiar as it seems to be, is reduced by Irmisch to a variety of *E. Helleborine*." Singularly enough, he at the same time adopts Crantz' varietal name (*E. Helleborine*, var. *viridans*.) Probably this was because he regarded the plant as essentially equivalent to the *E. latifolia* of Europe, which Linnæus had named *Scrapias Helleborine*, var. *latifolia*, but the two are quite dissimilar, and Reichenbach had good reason for separating them. Our plant differs from that in having narrower, longer and more tapering sepals, a lip destitute of tubercles or callosities or lobes on either the upper or lower part, all of which characters occur in the European *E. latifolia.* So decided is the difference upon close inspection that I have no hesitation in following Reichenbach and adopting Hoffman's name, *E. viridiflora*, notwithstanding the fact that the specific name is not well chosen to indicate the color of the flowers.

Three stations are now known for this plant. In addition to those near Syracuse and at Buffalo New York, another has recently been found at Toronto, Canada.

Microstylis.—Nuttall's section of *Malaxis* known under this name, as has been shown by Prof. Greene, is antedated by Rafinesque's name, *Achroanthes*, and our Northern North American forms become:

A. MONOPHYLLA (L.), Greene, Pitt. ii., 183 (1891).
Ophrys monophylla, L. Sp. Pl. 947 (1753).
Microstylis monophylla, Lindl. Bot. Reg. t. 1290 (1829).
A. UNIFOLIA (Mx.), Raf. Med. Rep. 2d Hex. v. 352 (1808).
Malaxis unifolia, Mx. Fl. ii. 157 (1803).
Microstylis ophioglossoides, Nutt. Gen. ii. 196 (1818).

Habenaria ciliaris and *H. blephariglottis.*—So far as I can see, the specific difference between these two forms can hardly be maintained. According to Michaux, who seems to have been the first to mention the white colored plant, it is merely a white variety of *H. ciliaris*, and this judgment appears correct. Dr. Asa Gray, in the Annals of the Lyceum of Natural History of New York, iii., 231, says that the two species "grow in similar situations and frequently in company, and are not readily distinguished except by the color of the flowers. But, as Prof. Hooker justly remarks in *H. ciliaris*, the lip is more thickly fringed, and the upper petals are likewise fringed; whereas in *H. blephariglottis* these are quite naked." Numerous specimens of the two species in the Columbia College Herbarium show that the lip varies in both species from loosely to thickly fringed, and is the same identically in shape. If it were the fact that in the one the petals are fringed and in the other not, that might serve to distinguish them, but it is now well known that the petal of *blephariglottis* are commonly as much fringed as in *ciliaris.* It is only in *blephariglottis* var.

holopetala, Torr., that the petals are entire, and I find many specimens of this species which show on the same plant all grades of petals from entire to cut-toothed and fringed. So that no dependence can be placed on the constancy of this character.

The very confusion into which authors have fallen in regard to these two species is significant. Willdenow, the author of the name *blephariglottis* (Sp. Pl. iv. 9, 1805), observes "very similar to *ciliaris*, but the narrow lip, the length of the highest petal and slightly ciliate. The corolla seems to be yellow." Dr. Torrey, in his Compendium of 1826, briefly describes them, and the description of either applies perfectly well to the other, except that the one is called "bright yellow" and the other "pure white." Hooker (Exot. Bot. t. 87), calls the var. *holopetala* "*Habenaria blephariglottis*," and Lindley names it "*Platanthera holopetala*," upon which Torrey (Fl., N. Y., ii. 277), who gives altogether the best description of the two species, remarks: "I certainly agree with Sir William Hooker in considering *P. holopetala* of Lindley as only a variety of this (*blephariglottis*) species, which again scarcely differs from the following (*ciliaris*) except in the white flowers. Lindley has even a white variety of *P. ciliaris*." Chapman reduces it to *H. ciliaris*, var. *blephariglottis*.

Lindley, in his Gen. and Sp. of Orchids, seems to have mixed matters badly, evidently knowing the species imperfectly. After converting *Orchis blephariglottis*, Willd., into *Platanthera holopetala*, he describes *Platanthera ciliaris* under two varieties, viz., var. *α*. with yellow flowers, which he attributes to Alabama, and var. *β*, with white flowers, which he attributes to Canada. It is to this that Torrey refers. Lindley could distinguish his *holopetala* from *ciliaris* only by its entire petals, which, as I have shown, is an inconstant character. So far as color goes, even if color alone were a sufficient ground for specific distinction, which it is not, I find in the Herbarium on sheets of undoubted *blephariglottis* labels from different collectors marked, "flowers, lemon yellow," and "flowers, lemon yellow, varying to *ciliaris*."

A careful comparison of the flowers in the two forms, as shown in the large collection at Columbia College, renders the following arrangement the most satisfactory:

Habenaria ciliaris (L.), R. Br. in Ait. Hort. Kew. Ed. 2, v. 194 (1813).

Orchis ciliaris L. Sp. Pl. 939 (1753). Mx. Fl. ii. 156 (1803).
Platanthera ciliaris, Lindl. Orchid., 292 (Aug. 1835).

Var. ALBA (Mx).

Orchis ciliaris, var. *alba*, Mx. Fl. ii. 156 (1803).
O. blephariglottis, Willd. Sp. Pl. iv. 9 (1805).
Platanthera blephariglottis, Torr. Fl. N. Y. ii. 277 (1843).
Habenaria ciliaris, v. *blephariglottis*, Chap. Fl. 460 (1860).

Var. HOLOPETALA (Lindl).

Platanthera holopetala Lindl. Gen. and Sp. Orch. 291 (Aug., 1835).
Habenaria blephariglottis, Hook. Exot. Fl. t. 87 (1825).
P. blephariglottis, *v. holopetala*, Torr. Fl. N. Y. ii. 277 (1843).

In this connection it is a matter of interest to note an irregular or monstrous form of *H. ciliaris* which was collected in the vicinity of New York during the last summer by Mr. Henry Ogden. The lip is either entire or imperfectly fringed and obovate, instead of being as in the normal form, long and deeply fringed and long ovate. In some of the flowers the anther cells are 4, in pairs, 2 parallel cells on one side, and 2 on the other; and in some cases there is another cell besides, back of one of the others. In some instances the lateral tubercle or swelling of the clinandrium is mounted upon one of the cells, or partly displaces its lower portion. Most of the flowers are entirely destitute of spurs. Some have spurs as long as the ovary, and a few have spurs not a quarter as long as the ovary.

This species frequently produces only a leaf the first year, flowering the second year. As a result, the collector is often disappointed upon going to a locality and finding no flowers where he found an abundance the year before. I have detected a similar habit in other species.

Habenaria flava.—Dr. Asa Gray examined the Herbarium of Gronovius containing the plant upon which Linnæus founded this species, and ascertained beyond a doubt that it is the same as that which has since been called *Habenaria virescens.* (See Am. Jour. Sci. & Arts, xxxvii. 307.) The history of its synonymy is a good illustration of the manner in which some plants under the old methods of nomenclature have travelled about from pillar to post. Dr.

Gray, in the article referred to, gives an outline of the synonymy up to 1840. It appears as *O. virescens*, Willd. Sp. Pl. 4, 37 (1805); as *Habenaria herbiola*, R. Br. in Ait. Hort. Kew. Ed. 2. v. 193, (1813); as *O. flava* and *O. fuscescens* in Pursh (1814), and *O. bidentata* in Elliott (1824). It was subsequently named *Platanthera herbiola* by Lindley in his Gen. et. Sp. Orchid., *H. herbiola* and, as a synonym, *H. virescens*, by Sprengel in his Systema, and then *Platanthera flava* by Dr. Torrey, Bot. N. Y., and by Dr. Gray in the first edition of his Manual. Had Dr. Gray abided by the opinion expressed in his article in the American Journal of Science, in which he says "the specific name is certainly not happily chosen for a plant of which Clayton observes "*floribus obsolete luteis*," *but it must nevertheless be retained*," all would have been well. In spite of this sound dictum, however, in his Manual, Ed. 5, 499, (1867) he rebaptizes the plant as "*Habenaria virescens*, Spreng," adopting Sprengel's synonym. This he does, apparently, because "the flowers are not yellow," though why he should have disregarded Sprengel's name *H. herbiola*, and the still older *H. herbiola* of R. Br. is not clear. In the sixth edition of the Manual the same name, "*virescens*, Spreng," is continued. Besides all this topsy-turvy, the species has had several other aliases. It is easy to see why our plant synonymy is in such a state of confusion when we find authors following their own caprices in substituting new names for old ones. Stability can be secured only by adhering firmly to the principle of priority, no matter what we may think of the appropriateness of the first specific name. The species should therefore be named:

Habenaria flava, (L.) Gray, Am. Jour. Sci. and Arts, xxxvii, 308 (1840).

Orchis flava, L. Sp. Pl. 942, (1753),

Cypripedium.—A single change in the names of our North American species should be noted.

C. reginæ, Walt. Fl. Car. 222 (1788).

C. album,—Ait. Hort. Kew. iii. 303 (1789).

C. spectabile,—Salisb. Trans. Linn. Soc. i. 78. t. 3, f. 3 (1791), and later authors.

On Legitimate Authorship of Certain Binomials with Other Notes on Nomenclature.

By Geo. B. Sudworth.

Among our North American trees are several species which bear names the authors of which custom, or a desire not to offend the memory of faithful explorers and collectors, has long held to be legitimate. In other words we have on record and in common use, names attributed to authors, who, although knowing them thoroughly, never described the species to which they applied the name. Many such designations appear for the first time as bare catalogue names or in narratives, and have been taken up and ascribed to their originators in some cases with small ground for knowing to what plant the writer applied the name. Closely related to this class of names are those with general notes or remarks on plant features possessed by several species in common, and rendering it exceedingly unsafe to judge of what species the author had in hand. Plant descriptions are highly unsatisfactory and uncertain (without figures) when most carefully drawn, especially with variable and closely related forms; but still less tenable are names founded upon no attempted description and upon such running remarks as "used for a yellow dye;" "a beautiful pine;" "a tall tree."

A few European collectors named our plants in the field, sending their specimens to home herbaria where on examination in a single place one might on seeing the plant with its appended label know what species the collector met, but which in the first published account of his journey is mentioned only by name. Following such lack of published data, painstaking botanists have later figured and described the same species, taking up, with the discoverer as the authority, the originally applied name. But who, in such cases, is the one responsible to the world of botanists at large for the validity of the name? Presumably, and in accordance with the requirements of properly publishing a species, the discoverer is not; for the botanists at large who cannot examine the original specimen, kept in a single herbarium, would never have known what manner of plant was meant, except from the one who described it and published it in some circulating medium. The discoverer is not, however, defrauded of his just dues in not being cited as the author of a species which he named but did not characterize; the graver responsibility of establishing the species must rest with the describer; for it is to him that the botanist looks for the characters of the plant. Moreover, knowing that no one is legitimately the author of a binomial by merely enumerating a bare name, it is wilfully misleading to quote Jones in our synonymy for a species when we find the characters of the plant not published under his name and by him, but subsequently published by Smith. A similar case is not that of a botanist who names and draws up the characters of his plant, transmitting his manuscript to some publishing monographer, as a part of a larger contribution. It is eminently proper in such cases, as law and custom has held, to credit the original describer.

The following cases are examples of plant names attributed to authors who named the plants they discovered, but described them either insufficiently or not at all.

Pinus ponderosa, Douglas, long attributed to David Douglas, who discovered the tree between the Columbia and Spokane rivers, Washington, in 1826, was named by this explorer (Hooker's Companion Bot. Mag. ii. 111, 141, 1836) *Pinus ponderosa*, but he nowhere described it. Douglas' name is therefore a *nomen nudum*. Two years later though (1838) Loudon (Arboretum et Frut. iv. 2243) figured and described the Bull Pine for the first time, erroneously I believe, appending "Douglas" to *Pinus ponderosa*, as Douglas left only a written label accompanying his specimens deposited in the Herbarium of the London Horticultural Society. Strictly, therefore, the name should be written *P. ponderosa*, Loudon. It is of the greatest interest in this connection, however, to note that Douglas' specimen (figured by Loudon, l. c.,) gives the type and locality of this variable species, which is of value in studying the other forms already separated from the type by Engelmann and others.

Pinus Sabiniana, Douglas (Comp. Bot. Mag. ii. 150, 1836) printed, however, *Pinus Sabinii* is a *nomen nudum*, and the species was published first by Lambert (Gen. Pinus, iii. 137, t. 58, 1837), who should be cited as the author.

The following synonyms are also *nomina nuda*. *Pinus grandis*, Douglas (l. c. 147) = *Abies grandis*, Lindley, being published with characters for first time by Hooker (Fl. Bor. Am. ii. 163, 1840); *Pinus amabilis*, Douglas (l. c. 93) = *Abies amabilis*, Forbes, established first by Antoine (Conif. 63, 1840); and *Pinus nobilis*, Douglas (l. c. 147, 1836) = *Abies nobilis*, Lindley, established by Lambert (Pinus iii. 167, 1837). The latter case was correctly understood by Koch (Dendrol. ii. pt. 2, 209), who placed *P. nobilis*, Douglas, at the bottom of his list of synonyms, when, if well founded, it should not have been preceded by Loudon's *Picea nobilis* of later date (1838).

Similar, but difficult cases to touch are such as *Pinus contorta* (Douglas Mss. in Herb. Lond. Hort. Soc.) London iv. 2292; and *P. insignis* (Douglas l. c.) Loudon l. c. 2265. As is clear, so far as Douglas is concerned, these names are *nomina nuda*, and should, if treated critically, be attributed to Loudon, who published them; credit for coining the names being given to Douglas in the historical synonymy of the species.

Abies concolor, Lindley & Gordon (in Journ. Hort. Soc. Lond. v. 210, No. 15, 1850), is a name accompanied by no description, but founded on "*Pinus concolor*, Engelm.," which at that time was only an herbarium name, and not published till 1868 (Parlat. in DeCandolle Prodr. xvi. Pt. 2, 426). The *A. concolor* of Lindley & Gordon must therefore be considered a *nomen nudum*, which it is in fact. The first properly published name applied to this fir is the *Picea concolor* of Gordon (Pinetum 155, 1858), and the combination *Abies concolor* must be attributed to Parry (Am. Nat. ix. 204, 1875), who described the species sufficiently to establish the name. His running characterization of *Abies concolor* is somewhat meagre, but if carefully weighed can apply only to the White Fir, in which case Parry becomes the author of *Abies concolor* (Gord.) = *Picea concolor* (Gordon, l. c. 1858).

The following names, at present treated as synonyms, seem to warrant restoration as the oldest for the species:

Fagus ferruginea, Aiton (Hortus Kew. iii. 362, 1789). There is no doubt but that Marshall sets forth the essential characters of the Beech under "Fagus, the Beech Tree" (Arbustum Am. 45), designating our species as *Fagus sylvatica atro-punicea*, "American Beech Tree" (l. c. 46, 1785), in the light of which Aiton's later name should be replaced by Marshall's, which was published four years earlier. The name for the American Beech would then become *Fagus atropunicea* (Marsh.)=*F. sylvatica atro-punicea*, Marsh. (l. c. 1785)=*F. ferruginea*, Aiton (l. c. 1789).

Carpinus Caroliniana, Walter (Flora Car. 238, 1788). The first name applied to this species is that of Marshall, *Carpinus Betulus Virginiana* (Arbustum Am. 25, 1785), antedating Walter's name by three years. There can be no reasonable doubt as to what plant Marshall applied his name, either as shown in his diagnosis of the genus *Carpinus* or in his description of the "American Hornbeam." Walter's long-established—but misapplied—specific name *Caroliniana* should, therefore, give place to Marshall's earlier —but equally misapplied—*Virginiana*, the name for the Blue Beech then becoming *Carpinus Virginiana* (Marsh.)=*C. Betulus Virginiana*, Marshall (l. c. 1785)=*C. Caroliniana*, Walter (l. c. 1788) =*C. Americana*, Lam. (Encycl. iv. 708, 1797).

Salix lasiandra, var. *Fendleriana*, Bebb. (Bot. Calif. ii. 84, 1880), Nuttall appears to have been the first to describe this Western willow, under the name *Salix pentandra*, var. *caudata* (Sylva i. 61, t. 18, 1842), a name which is commonly cited as a synonym of var. *Fendleriana*. Prof. Bebb's reason, if any exists, for not maintaining the older varietal name for this plant is unknown to us at present; but as it is well known to be the original name, it seems desirable to now reinstate Nuttall's var. *caudata*, which would give *S. lasiandra*, var. *caudata* (Nutt)= *S. pentendra*, var. *caudata*, Nuttall (l. c., 1842)= *S. lasiandra* var. *Fendleriana*, Bebb (l. c., 1880).

Populus monilifera, Aiton (Hort. Kew. iii. 406, 1789). Marshall describes a tree under the name *Populus deltoide* (Arbustum Am., 106, 1785), which cannot be ignored as inapplicable to one of our Eastern Poplars. Koch (Dendrologie ii. Pt. 1, 487), doubtfully referred Marshall's species (corrected to "deltoides") to *Populus grandidentata*, Michx., and later Prof. Sargent makes it a synonym of *P. monilifera*, a decision which, we believe, is correct. For a careful examination of the various forms and stages of leaf development of this cottonwood does not require imagination to reconcile Marshall's description of this tree. The geographical range indicated by him is, moreover, in accordance with what is known to be true, and certainly applies only in part to the Large-toothed Aspen. In this event Marshall's *Populus deltoide*(*s*) (1785) should replace Aiton's *P. monilifera* (1789).

Populus balsamifera, var. *candicans*, A. Gray (Man. Ed. 2, 419, 1856). It has been generally conceded that the *Populus Canadensis* of Moench (Verz. Baume, No. 81), published in 1785, was applied to the variety of our Balm-of-Gilead, and is, therefore, an older name than Gray's *candicans* by seventy-one years. The *P. balsamifera lanceolata*, Marsh (1785), of the same date, and also referred to this variety as a synonym, doubtless had better be referred to the type, the characters of which seems to fit Marshall's description with fewer allowances than are necessary in applying his name to the variety. The name for this variety should then become *P. balsamifera*, var. *Canadensis* (Moench) = *P. Canadensis*, Moench (l. c., 1785) = *P. balsamifera*, var. *candicans*, A. Gray (l. c., 1856).

Thuya gigantea, Nuttall (Journ. Phil. Acad. vii. 52, 1834). The oldest name applied to this species is the *T. plicata* of Donn. (Hort. Cantab. Ed. 6, 249, 1811); but this name was published without description, and must be considered a *nomen nudum*. Lambert, however, established the name eleven years later, 1824 (Gen. Pinus, Rd. 1, ii. 19), and ten years before Nuttall applied *T. gigantea*. *T. plicata*, of Lambert, (1824) should, therefore, replace *T. gigantea*, of Nuttall, (1834).

Pinus Banksiana Lambert (Gen. Pinus Ed. 1, 7, t. 3, 1803). In the first edition of Aiton's Hortus Kewensis (iii. 366, 1789) occurs this trinomial, "*Pinus sylvestris, divaricata*," founded on one of the principal characters of the Jack Pine, *foliis divaricatis obliquis, Habitat ad Sinum Hudsonis*. There is but one other pine in North-eastern North America, besides the Jack Pine, having two leaves in a sheath which could have been confused, i. e., the Red Pine (*Pinus resinosa*); a species which Aiton carefully and fully describes on the next page of the same work. As acknowledged, moreover, by De Candolle and others, who cited the name as a synonym of Lambert's *P. Banksiana*, there can be no question but that the Northern Jack Pine was the tree named. The name for this pine should then be *Pinus divaricata* (Aiton) = *P. sylvestris, divaricata* (Aiton, l. c., 1789) = *Pinus Banksianna*, Lambert (l. c., 1803).

P. Cubensis, Grisebach (Mem. Am. Acad. viii, Pt. 2, 530, 1863). The first account of this Southern and West Indian pine is by Stephen Elliott, who considered it a variety of the common Loblolly Pine, calling it *Pinus Tæda*, var. *heterophylla*, (Sketch Bot. S. C. and Ga. ii. 636, 1824). It was imperfectly known to Elliott, who observed it only in Georgia, its later-discovered geographical range not being known then, although he well recognized its distinctness among the other mainland pines. His description lacks any mention of the cones, showing that he had not observed their very distinct appearance, yet his characterization of male flowers, leaves, bark, wood, and habitat, points unquestionably to the so-called Cuban Pine. Fortunately, the varietal name *heterophylla* is most fitting in its application to this pine, a marked feature of the species being that its leaves occur two and three in a sheath on the same branch. Since, therefore, the insular *Pinus Cubensis* and mainland forms are now known to be the same; there appears to be no good reason for not reinstating Elliott's original varietal name in specific rank. Dr. Engelmann did not hesitate to cite Elliott's name as an equivalent of his own, later, *P. Elliottii* (Trans. St. Louis Acad. iv. 186, t. 1, 2, 3, 1879), which in now to be considered a synonym of Grisebach's older *P. Cubensis.* The name for the Cuban Pine would then become *P. heterophylla* (Ell.) = *P. Tæda* var. *heterophylla*, Elliott (l. c., 1824) = *P. Cubensis*, Grisebach (l. c., 1863) = *P. Cubensis*, var. *terthocarpa*, Wright (in Griseb. Cat. Pl. Cub. 217 (1866) = *P. Elliottii*, Engelmann (l. c., 1879).

Abies magnifica, Murray, (Proc. Royal Hort. Soc. Lond. iii. 318, f. 25, 33, 1863.) Murray seems to have published in 1860 another name for this species, *A. campylocarpa*, three years earlier than the now generally accepted *A. magnifica.* It is desirable if possible to reinstate the older *A. campylocarpa*, but the foundation upon which it rests appears to be insecure. The leaves described under *A. campylocarpa* might belong equally well to the closely related *A. nobilis*; but the length of the cone noted excludes all other associated species. The inference then to be drawn from the fact that no mention is made under *A. campylocarpa* of conspicuously exserted bracts (common to *A. nobilis*) points circumstantially to *A. magnifica* as the only fir to which Murray could have applied his name. The uncertainty, however, seems too great to warrant a change of a well-known and established name, especially with respect to species not too well defined. Provisionally, therefore, *A. campylocarpa* may be retained as a synonym of the later, but better founded *A. magnifica.*

Canella alba, Murray, (in Linn. Systema Veg. ed. 14, iv. 443, 1784.)

Linnæus' *Laurus Winterana* (Spec. Pl. ed. 1, 371, 1753, exclusive "Hab. in Carolina") is the oldest name applied to this semi-tropical Florida and West Indian tree. Gaertner (Fruct. i. 377, t. 77, 1788) took up Linnaeus' specific name *Winterana* under *Canella,* but was not followed by subsequent authors. It is evident, however, that Gaertner's *Canella Winterana* should be maintained. Linnaeus' *Winterania Canella* (Spec. Pl. ed. 2, 636, 1763) is also an older name than Murray's *C. alba,* which if taken up would give (*Canella Canella*) a combination, though that fortunately can now be avoided.

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On the American Black Cottonwood.*

By P. A. Rydberg.

(Plates CXL. and CXLI.)

"372. *Populus sp* . . . . . . When approaching the Carter Canon, in Scott's Bluff County, I saw, at a distance, some dark green trees with pyramidal crowns. Not knowing any other tree with dark foliage and pointed top growing in the region, I took them for unusually tall specimens of *Juniperus Virginiana.* Coming a little nearer, I saw my mistake. It was a *Populus,* unlike all I have seen. As the buds were very balsamiferous and the leaves cuneate at the base, I thought it was nothing but *P. angustifolia,* which I have never seen growing. When at home, I compared it with my specimens of this poplar, collected by Mr. T. A. Williams in the Hat Creek Basin in North-western Nebraska, and I saw at once the difference between the two. Although the leaves of my poplar are rhomboid-ovate, cuneate at the base, and not whitened beneath, I do believe that, if not distinct from both, it is a variety of *P. balsamifera* rather than of *P. angustifolia.* The leaves are rhomboid, on petioles 1-2 inches long (in *P. angustifolia* they are only ½-1 inch.), generally long-acuminate, shining on both sides, regularly crenate except at the cuneate base. The teeth are larger, more distant, and more regular than in *P. angustifolia.* Dr. Bessey states that the general appearance of the true *P. angustifolia* is more that of a willow than of a poplar, which is not at all the case with this. The general growth, the size, form, and color of the trunk were somewhat between those of *P. balsamifera* and *P. angulata*, although most like the former. The long and slender petioles remind one of the latter or even of the Quaking Aspen. Dr. S. Watson says in his Revision about *P. angustifolia:* "Two forms are spoken of, the Yellow Cottonwood, making fair lumber, and the Black Cottonwood, common and extensively planted in Utah, but the wood is considered worthless." May be, this is the former. I saw it growing only at one place, viz., in Carter Canon, where it grew along the brook, together with *P. angulata.* The grove contained over 100 trees of this poplar, 40 to 60 feet high, some measuring 18 inches in diameter. Carter Canon, S. B. Co., July 26."

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*Read before the Botanical Seminar of the University of Nebraska.

The above is an abstract from my list of plants, collected in Western Nebraska, in the summer 1891, for the U. S. Department of Agriculture. John M. Holzinger, Assistant Botanist of the same department, who afterwards examined my collection, wrote me, among other things concerning this tree: "I make it, after careful consideration, *Populus angustifolia*, James. The difficulty seems to arise from the mature leaves: herb. material generally has them undeveloped." I still believe, however, the above to be distinct from *P. angustifolia*, James, or, at least, from what we have been used to call so. I saw both, this summer:—my No. 372 both with undeveloped and mature leaves, and the true *P. angustifolia*, on the 28th of June, at which time the leaves, although not mature, yet had received their form. Specimens with mature leaves are found in the herbarium of the University of Nebraska.

Judging from the material on hand, I do not hesitate to declare them to be distinct species. Perhaps, if I had a fuller series of specimens, I would be of another opinion. Taking for granted that they are two distinct species, or, at least, two varieties, let us see which has the right to the name of *Populus angustifolia,* James.

The original description by James I have not seen, but I must suppose that both Dr. Watson and Nuttall knew James' tree, and have described the same. Dr. Watson writes in his Revision of the North American Cottonwoods:

"*P. angustifolia,* James. Leaves not white beneath, rhombic-ovate to narrowly lanceolate, mostly cuneate at the base, often small, petioles one-half inch long or less (rarely one inch), etc."

In King's Report, the description of *Populus balsamifera,* var. *angustifolia,* contains among other characters:

" . . . leaves ovate-lanceolate, attenuate at the base, acute, glabrous, crenate-serrate. Leaves varying much between the ordinary growth (2′–3′ long by 8″–12″ wide, acute and often sub-rhomboidal) and that of younger shoots where they may be 6′–8′ long and 3′ or more broad, and often cordate at base, always with long acumination."

Nuttall, in Silva Americana, gives about the same description, and adds:

"The footstalks of the leaves or petioles are about three-fourths to an inch in length. The nerves are all faint beneath and pinnate, with no appearance of being 3-nerved at the base; the number of these nerves or lateral vessels is twelve to fifteen on a side, at least double the number they are in the Balsam Poplar."

These descriptions can only apply to the form we are used to call *P. angustifolia,* James. All specimens thereof found at present in the Herbarium of the University of Nebraska, agree in that the petioles are short, from ½ to 1 inch long, and the lateral nerves are, at least in the larger leaves, about 10–15 on each side. (See Plate CXL.). In the specimens of my No. 372, from Carter Canon, and of the same tree collected, this year, at Hot Springs, S. D., the petioles are from 1–2 inches or even more, and the lateral nerves seldom more than 8.

As it is remarked by Dr. Watson, the leaves of the Black Cottonwood vary considerably, especially on young shoots. All specimens I have used for comparison are taken, however, from trees over 20 feet high. The first leaves from the bud are generally more or less ovate, 1–2½ inches long. These are followed by lanceolate leaves, 2–5 inches. All the leaves are gradually acuminate towards the apex, and finely crenate-serrate from base to tip. In the specimens collected by Dr. Bessey, at Manitou, Col., July 18, 1886, the first leaves are very broad, with rounded or even cordate base. In my own specimens from Little Elk Canon, S. D., June 28, 1892, the leaves are small and nearly all lanceolate.

The leaves of my No. 372 differ, besides in the length of the petiole, in being rhomboidal, always having cuneate base and an abrupt acumination. The teeth are scarcely any from the base to near the broadest part of the leaf, from there they are more regular and larger than in *P. angustifolia*, till they disappear again at the acumination. The specimens from Carter Canon have the leaves twice as long as broad, and with long acumination. In those from Hot Springs the leaves are broader (the breadth equalling ⅔ or ¾ of the length) with a shorter acumination. The latter are in form like the leaves of *P. Hudsonica*, Michx. f., figured in Silva Americana, but the shoots and petioles are not hairy. They also resemble those of the Black Cottonwood of Europe, *P. nigra* (*P. Hudsonica*, according to Gray), which, however, if I am not mistaken, has angled petioles. It seems to approach the true cottonwoods in several respects.* I have mentioned above the form of the leaves and the length of the petioles. The old bark resembles somewhat that of *P. monilifera*, but is whiter. The crown, although pyramidal in form, is more extensive than in *P. angustifolia*, the branches being more spreading and the leaves semi-pendent. The trees of *P. angustifolia* that I have seen were all narrowly pyramidal with ascending branches, giving them the aspect of a willow, a fact, as is stated before, which then has been noticed by Dr. Bessey.

What, is this cottonwood? Four alternatives present themselves to me: a species distinct from *P. angustifolia*, a local variety, a mere form of the same, or a hybrid. As I have stated before, I am most inclined to believe the first. A local variety, produced by the climate, it cannot very well be, as the two are growing in

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*In D.C. Prod., the American Black Cottonwood is referred to the common Cottonwood, under the name *Populus Canadensis*, var. *angustifolia*, Wesmael. To place our *P. angustifolia* as a variety of *P. Canadensis* (*P. monilifera*) was, indeed, a blunder. If Wesmael had seen my No. 372, instead of the true *P. angustifolia*, the mistake would be, perhaps, more excusable.

Mo. Bot. Garden

the same habitat, viz.: in canons, near water, at the same altitude, and in the same region. A mere form, or individual variation of the Black Cottonwood, it cannot be. Of the more than 100 trees growing in Carter Canon, I did not see a single one that had lanceolate leaves with short petioles, nor a narrow crown; and at Little Elk, where I saw about as many trees of the true *P. angustifolia*, I did not notice a single one that had the long petioles and abrupt acumination characteristic of my No. 372. At Hot Springs, I saw only three Black Cottonwoods, and all three agreed with those from Carter Canon, except that the leaves were broader. Dr. Chas. E. Bessey and Prof. T. A. Williams, of South Dakota Agricultural College, who have both seen the Black Cottonwood several times have not seen a form like this. The fact that my No. 372, in both places was growing together with *P. monilifera*, might suggest the possibility of its being a hybrid of that and *P. angustifolia;* but the total absence of the latter tends to show the contrary.

Believing that there are two American Black Cottonwoods, I shall try to give the distinguishing characters:

Populus angustifolia, James.—Leaves lanceolate or ovate, gradually acuminate, with cuneate, rounded, or heart-shaped base, on short petioles (½ inch long), thickish, drying yellowish or brownish, finely crenate-serrate from base to apex; lateral nerves in the larger leaves often 10-15; crown narrowly pyramidal with ascending branches. Collected by Dr. Chas. E. Bessey, at Manitou, Col., July 18, 1886, etc.; by T. A. Williams, in War Bonnet Canon, June, 1890, etc.; by myself, in Little Elk Canon. (Plate CXL.)

Populus acuminata, n. sp. (No. 372 of my Nebraska Collection). Leaves more or less rhomboidal, abruptly acuminate, with cuneate base and long petioles (1′–2′ long, or more), semi-pendent, thinner than in the preceding, drying green; denticulation scarcely any at the base and near the top; at the middle, regular and larger than in the preceding; lateral nerves seldom more than 8 on each side; crown broadly pyramidal with spreading branches. Collected by me in Carter Canon, Scott's Bluff Co., Neb., July 25, 1891, and at Hot Springs, S. D. (Plate CXLI.)

LUTHER ACADEMY, WAHOO, NEB., Oct. 15, 1892.

X

[Mr. Rydberg's description of *P. angustifolia* and his figure (Plate CNL.) agree accurately with James' type specimen, preserved in Herb. Torrey. N. L. B.]

A Century of American Weed Seeds.

By Byron D. Halsted.

A collection of one hundred kinds of weed seeds, brought together in the shape shown in the accompanying engraving, is a new thing in American Economic Botany.

The seeds are placed in dram metal screw-cap vials, arranged in a shallow tray about the length and breadth of a standard herbarium sheet, as illustrated in the cut. Each bottle bears a number and the botanical and one or more common names of the species of the seed contained therein, as for example:

"No. 34. *Anthemis Cotula*, L. Mayweed, Dog-fennel."

Upon the underside of the cover to the tray is pasted a full list of the species with numbers to correspond with those upon the vials. After the common names the letter A indicates that the species is annual; B, biennial; and P, perennial. Thirty-eight (38) are native species and sixty-two (62) are from abroad, thus showing a large majority of foreign origin. The annuals lead with forty-eight (48) species; perennials next with thirty-five (35); biennials, fifteen (15); and two (2) live either one or two years.

The following is the list of species :

RANUNCULACEÆ—Crowfoot Family.

1. *Ranunculus bulbosus*, L. Buttercup. P.†

CRUCIFERÆ—Mustard Family.

2. *Barbarea vulgaris*, R. Br. Yellow Rocket. B.
3. *Brassica nigra*, (L.) Koch. Black Mustard. A.
4. *Brassica Sinapistrum*, Boiss. Charlock. A.
5. *Bursa pastoris*, (L.) Weber. Shepherd's Purse. A.
6. *Lepidium campestre*, (L.) R. Br. Field Pepper-grass. A.
7. *Lepidium Virginicum*, L. Pepper-grass. A.
8. *Raphanus Raphanistrum*, L. Wild Radish. A.
9. *Sisymbrium officinale* (L.) Scop. Hedge Mustard. A.

CARYOPHYLLACEÆ—Pink Family.

10. *Agrostemma Githago*, L. Corn Cockle. A.
11. *Saponaria officinalis*, L. Bouncing Bet. P.

PORTULACACEÆ—Purslane Family.

12. *Portulaca oleracea*, L. Purslane. A.

MALVACEÆ—Mallow Family.

13. *Abutilon Avicennæ*, Gærtn. Velvet-leaf. A.
14. *Hibiscus Trionum*, L. Bladder Ketmia. A.
15. *Malva rotundifolia*, L. Mallow. P.

GERANIACEÆ—Geranium Family.

16. *Erodium cicutarium*, L'Her. Storksbill. A.

LEGUMINOSÆ—Pea Family.

17. *Cassia Chamæcrista*, L. Partridge Pea. A.
18. *Crotalaria sagittalis*, L. Rattle-box. A.
19. *Medicago lupulina*, L. Nonesuch. B.
20. *Melilotus alba*, Lam. White Melilot. A–B.
21. *Melilotus officinalis* (L.) Lam. Sweet Clover. A–B.

ROSACEÆ—Rose Family.

22. *Agrimonia Eupatoria*, L. Agrimony. P.

ONAGRACEÆ—Evening Primrose Family.

23. *Œnothera biennis*, L. Evening Primrose. B.

PASSIFLORACEÆ—Passion-flower Family.

24. *Passiflora incarnata*, L. May-pops. P.

FICOIDEÆ—Carpet-weed Family.

25. *Mollugo verticillata*, L. Carpet-weed. A.

UMBELLIFERÆ—Parsnip Family.

26. *Daucus Carota*, L. Wild Carrot. B.
27. *Pastinaca sativa*, L. Wild Parsnip. B.

RUBIACEÆ—Madder Family.

28. *Diodia teres, Walt.* Buttonweed. A.

DIPSACEÆ—Teasel Family.

29. *Dipsacus sylvestris*, Huds. Teasel. B.

COMPOSITÆ—Sunflower Family.

30. *Achillea Millefolium*, L. Yarrow. P.
31. *Ambrosia artemisiæfolia*, L. Ragweed. A.
32. *Ambrosia trifida*, L. Great Ragweed. A.
33. *Anthemis arvensis*, L. Chamomile. A.
34. *Anthemis Cotula*, L. Mayweed. A.
35. *Arctium Lappa*, L. Burdock. P.
36. *Bidens bipinnata*, L. Spanish needles. A.
37. *Bidens frondosa*, L. Beggars-ticks. A.
38. *Chrysanthemun Leucanthemum*, L. Daisy. P.
39. *Cichorium Intybus*, L. Chicory. P.
40. *Carduus arvensis*, L. Canada Thistle. P.
41. *Erechthites hieracifolia* (L.) Raf. Fireweed. A.
42. *Erigeron annuus* (L.) Pers. Fleabane. A.
43. *Erigeron Canadensis*, L. Horse-weed. B.
44. *Erigeron ramosus* (Walt.) B. S. P. Rough Fleabane. B.
45. *Hieracium aurantiacum*, L. Golden Hawkweed. P.
46. *Lactuca Canadensis*, L. Wild Lettuce. B.
47. *Lactuca Scariola*, L. Prickly Lettuce. B.
48. *Rudbeckia hirta*, L. Cone-flower. P.
49. *Solidago lanceolata*, L. Narrow Golden-rod. P.
50. *Solidago rigida*, L. Stiff Golden-rod. P.
51. *Sonchus oleraceus*, L. Sow Thistle. A.
52. *Taraxacum officinale*, Web. Dandelion. P.
53. *Vernonia Noveboracensis* (L.) Willd. Iron-weed. P.
54. *Xanthium Canadense*, Mill. Cocklebur. A.
55. *Xanthium spinosum*, L. Spiny Clotbur. A.

APOCYNACEÆ—Dogbane Family.

56. *Apocynum cannabinum*, L. Dogbane. P.

ASCLEPIADACEÆ—Milkweed Family-

57. *Asclepias Syriaca*, L. Milkweed. P.

BORRAGINACEÆ—Borage Family.

58. *Cynoglossum officinale*, L. Hound's-tongue. B.
59. *Echinospermum Lappula* (L.) Lehm. Stick-seed. B.
60. *Echium vulgare*, L. Blue-weed. B.

CONVOLVULACEÆ—Morning-glory Family.

61. *Convolvulus arvensis*, L. Bindweed. P.
62. *Ipomœa hederacea*, Jacq. Morning-glory. A.

SOLANACEÆ—Night-shade Family.

63. *Datura Stramonium*, L. Thornapple. A.
64. *Datura Tatula*, L. Purple Thornapple. A.
65. *Physalis Virginiana*, Mill. Ground-cherry. P.
66. *Solanum Dulcamara*, L. Bitter-sweet. P.

SCROPHULARIACEÆ—Figwort Family.

67. *Linaria vulgaris*, Mill. Toad-flax. P.
68. *Verbascum Blattaria*, L. Moth Mullein. B.
69. *Verbascum Thapsus*, L. Mullein. B.

OROBANCHACEÆ—Broom-rape Family.

70. *Orobanche ramosa*, L. Broom-rape. A.

BIGNONIACEÆ—Bignonia Family.

71. *Tecoma radicans* (L.) Juss. Trumpet-flower. P.
72. *Verbena hastata*, L. Blue Vervain. P.
73. *Verbena urticæfolia*, L. Vervain. P.

LABIATÆ—Mint Family.

74. *Brunella vulgaris*, L. Heal-all. P.
75. *Leonurus Cardiaca*, L. Motherwort. P.
76. *Nepeta Cataria*, L. Catnip. P.

PLANTAGINACEÆ—Plantain Family.

77. *Plantago lanceolata*, L. Rib-grass. P.
78. *Plantago major*, L. Common Plantain. P.
79. *Plantago Rugelii*, Dec. Native Plantain. P.

AMARANTACEÆ—Pigweed Family.

80. *Amarantus albus*, L. Tumble-weed. A.
81. *Amarantus chlorostachys*, Willd. Amaranth. A.
82. *Amarantus paniculatus*, L. Branched Pigweed. A.
83. *Amarantus retroflexus*, L. Pigweed. A.

CHENOPODIACEÆ—Goosefoot Family.

84. *Chenopodium album*, L, Goosefoot. A.

PHYTOLACCACEÆ—Pokeweed Family.

85. *Phytolacca decandra*, L. Pokeroot. Scoke. A.

POLYGONACEÆ—Smartweed Family.

86. *Polygonum Convolvulus*, L. Black Bindweed. A.
87. *Polygonum Pennsylvanicum*, L. Smartweed. A.
88. *Rumex Acetosella*, L. Sorrel. P.
89. *Rumex crispus*, L. Curled Dock. P.
90. *Rumex obtusifolius*, L. Bitter Dock. P.

EUPHORBIACEÆ—Spurge Family.

91. *Euphorbia maculata*, L. Spotted Spurge. A.
92. *Euphorbia Preslii*, Guss. Spurge. A.

GRAMINEÆ—Grass Family.

93. *Agropyrum repens* (L.) Beauv. Quack-grass. P.
94. *Bromus secalinus* L. Chess. A.
95. *Cenchrus tribuloides*, L. Bur-grass. A.
96. *Panicum capillare*, L. Witch grass. A.
97. *Panicum Crus-galli*, L. Barnyard-grass. A.
98. *Panicum sanguinale*, L. Crab-grass. A.
99. *Chamæraphis glauca* (L.) Kuntze. Fox-tail. A.
100. *Chamæraphis viridis* (L.) Kuntze. Green Fox--tail. A.

The hundred species are distributed among thirty-one families. Twenty-six (26), or more than a quarter, belong to the large weedy order Compositæ. Other well-represented orders are the mustards and the grasses, each having eight species.

It is a well-known fact that weeds are often introduced into new localities in field, and even garden seeds; sometimes as many as forty kinds of weed seeds have been identified in a sample of clover seed, and grass seed is frequently no less free from foul stuff. Therefore sets of these seeds, as shown in the engraving, have been prepared to aid *stationists* (pardon the coining of a new word for station-agriculturists, station-horticulturists, station-botanists and other station workers taken collectively) and seedsmen in determining the exact nature of much of the impurity found in commercial seeds.

COLLEGE EXPERIMENT STATION, NEW BRUNSWICK, N. J., Dec. 29, 1892.

Preliminary Report on the Flora of Luzerne County, Penn.

BY A. A. HELLER.

We are more or less prone to consider the long-settled portions of our country old and undesirable ground, when botanical exploration is thought of. Mexico, the far West, or some other distant point, claims our attention, and we forget that all around us is an abundance of territory that has never been touched by a botanical collector.

I have just begun to realize that the State of Pennsylvania is a great botanical wilderness. Many of the counties have never been explored, or only partially. Most of the work that has been done is due to the untiring energy of Prof. Thos. C. Porter. Our own county of Lancaster, which can boast of almost fifteen hundred species, an account of which has been published by Dr. Porter, has a great tract of limestone and new red sandstone, comprising more than half of the county, that is sadly in need of attention.

To me, one of the most interesting of these "wild" counties is Luzerne, situated somewhat northeast of the centre of the State. To the Torrey Club it is especially interesting, as it falls within the limits of the Preliminary Catalogue, the one hundred mile circle cutting through the eastern part of the county.

During the summer of 1888 my attention was first called to its interesting flora, while staying at Berwick, Columbia county. The northern part of Berwick touches the southern boundary of Luzerne county. The county is cut almost in half by the Susquehanna river, and contains seven marked geological formations. Within three of these, Chemung, Hamilton and Catskill formation, and in territory chiefly within the limit of glacial action, it has been my privilege to collect, though to a very limited extent. The terminal moraine, as I have since ascertained, makes its appearance at Wapwallopen, about seven miles above Nescopeck, runs in a southwesterly direction across the river, which it follows nearly to Berwick, and thence passes into Columbia county.

On the high bluff on the right bank of the river, and almost on the southern boundary line, is a quantity of *Tissa rubra*, and along the steeply-sloping sides, numerous patches of *Sedum acre*. Following north, along the tracks of the Delaware, Lackawanna & Western Railroad, which runs parallel to the river and canal, many of our common plants are to be found. Here *Solidago juncea* blooms earlier than at any other place where I have seen it, making its appearance in July.

Asclepias obtusifolia is not common, only two or three plants being observed, while a rare find in the shape of three plants of *Spiræa rubra*, the only ones that I have ever seen growing wild, peeped out from the rank growth of grass and bushes. *Apios tuberosa* twined over the bushes, near neighbor to *Phlox maculata* and *Lathyrus palustris*. Down along the low margin of the canal a tangled mass of *Myosotis laxa* was guarded by the large and showy blue flag, *Iris versicolor*. In a little swampy place along the river, *Veronica scutellata* flourished, and in drier and more open places, *Ranunculus acris* and *Œnothera pumila*. Growing in the sand on the river brink, was a little patch of *Ranunculus reptans*, which is completely submerged except at times of low water.

In March, 1892, I spent two days at Berwick, and, while taking a walk along the railroad, observed a number of small pine trees growing on the side of the bank. They were full of cones, and close inspection satisfied me that they are *Pinus echinata*, although I do not have specimens to substantiate the determination. If it is really this pine, its appearance so far North is remarkable, at least at such a distance from the coast.

Crossing the river to Nescopeck, and following up the left bank for about the same distance as on the right bank, namely, about a mile and a half, quite a different flora is observed. One of the first things noticed was a stalk or two of *Cacalia suaveolens*, and further on an occasional plant of *Physostegia Virginiana* and *Hypericum ellipticum*. Overhanging the river bank in deep, shady places, were clumps of *Rhododendron maximum*, the recollection of which leaves a bright spot in one's memory, for few things are prettier than the sea of glossy green leaves, intermingled with the glorious flower clusters of *Rhododendron*. I do not attach a specific name, as it is not an easy matter to decide which *Rhododendron* is the most handsome, for when I first saw the gorgeous purple masses of *R. Catawbiense* at Blowing Rock and on Grandfather Mountain, North Carolina, they seemed more beautiful than any other, until the delicate white and pink of *R. maximum* appeared almost at our very doors. Two rare finds were *Stellaria uliginosa* and *Pyrola chlorantha*, each represented very sparingly.

Following Black Creek for a short distance beyond Nescopeck, only a few things of interest were found, among which were *Monarda fistulosa*, var. *rubra*, *Veronica Virginica* and two forms of *Spiræa salicifolia*, one with broad leaves, and the other with narrow ones. One day I heard of a little body of water, which was said to be a famous place for water lilies, and rightly concluded that other plants might be found there. Locally it is known as the "Pond," and "Lily Lake," and officially on the map as Long Pond. It is situated some ten or twelve miles northeast of Berwick, and about three miles from the river. It was visited first on July 5, 1888, then on June 24th and July 29, 1889, by myself, and on August 15th and 16th, 1889, by Mr. Small and myself, and by us again on September 20, 1890. Then came an interval of two years, until September 16th and 17th, 1892, when Miss E. Gertrude Halbach and myself made the so far final trip, and of it I intend especially to speak.

On the morning of September 16th we crossed from Berwick to Nescopeck, taking the train to Pond Hill, a station nine miles farther north. Just opposite the station, and only a few feet from it, at the base of the hill which skirts the river, is an outcropping of rocks full of imprints of crinoids and other fossils. Upon the rocks were found *Woodsia Ilvensis* and a few plants each of *Camptosorus rhizophyllus*, *Asplenium Trichomanes*, and *Arabis lyrata*. Here Nature had been lavish with her paint-brush. Under the trees of *Cornus florida*, whose bright-colored leaves lit up the wooded hillside, was an abundance of *Solidago bicolar*, *S. cæsia*, and *Eupatorium ageratoides*. The fence rows were purple with *Aster Novæ-Angliæ*. About three hundred yards from the station the road turns to the right, through the woods, and up to the top of the hill. Along this road the polymorphous *Solidago nemoralis* was very plentiful, as was *S. lanceolata* and *S. latifolia*. *S. squarrosa* was found only occasionally.

It is to be regretted that we did not take an old road below the present one, for along it in 1889 I found several specimens of *Solidago rupestris*, a very rare find for Northeastern Pennsylvania. This old road was reserved for the return trip, but at that period time, which is no respecter of botanists, was urging us on at a lively gait in order to catch the train. There was just one cause for regret, and that was when we came to the station for the rare *Aster concinnus*, discovered by Mr. Small and myself in 1890. The farmer along whose fence they grew had an idea that "weeds" do not improve the appearance of fence-rows, and had cut them down. Owing to this only two poor specimens were obtained.

The lake, a beautiful little sheet of water about two miles long and a mile wide, is evidently a relic of the glacial period. According to the aneroid barometer, it is 880 feet above sea level, and 480 feet above the river. On the north it is skirted by a low mountain ridge, on the west by gently-sloping ground, with indications that there was once an outlet on that side, and on the other sides by low and often swampy ground. It is a veritable botanical Paradise. The chocolate-colored water is full of little peat islands, literally swarming with vegetation, while the shores are lined with shrubs, and the woods full of interesting plants. A boat was procured, and a voyage of discovery begun. Among the first things observed were the tiny yellow flowers of *Utricularia gibba* rising from a very ugly-looking mixture of peat and mud. Masses of roots of *Castalia odorata* were floating about, nuclei for the growth of future vegetation. A very tempting-looking bush of *Ilex verticillata*, var. *padifolia* caused us to land and investigate the shore.

A good supply of several forms of *Ilex* was gathered, in addition to *Spiræa salicifolia*, *S. tomentosa*, *Cassandra calyculata*, *Polygonum emersum*, and *Vaccinium corymbosum*, var. *amœnum*. *Vaccinium disomorphum*, so plentiful two years before, the taste of whose fruit seems still to linger, was not observed. At that time the fruit was so plentiful that its weight bent the bushes almost to the water's edge.

Pushing off again, we were soon among colonies of *Xyris Caroliniana*, *Eriocaulon septangulare*, *Oxycoccus macrocarpus*, *Eleocharis olivacea*, found nowhere else in Pennsylvania, and *Juncus pelocarpus* found at one other station in the State. Winding in and out among the bushes of *Cephalanthus occidentalis* and clumps of *Nesæa verticillata*, which form a sort of breakwater, we hove in sight of "Stumptown," as it was promptly christened, near the upper end of the lake. It seems at one time to have been dry, or as near dry land as is possible there, for stumps are very plentiful, and so are lilies, their pretty white and golden cups resting lightly upon the surface of the water. *Sarracenia purpurea* was searched for, but in vain, although it is found there earlier in the season. An almost submerged log near the shore is headquarters for *Drosera rotundifolia* and *D. intermedia*, var. *Americana*, the two sometimes growing matted together. Another landing was made, and fine specimens of *Aster corymbosus*, *A. linariifolius*, *A. undulatus* and other plants were collected. A hasty investigation of the opposite or north shore yielded *Polygonum hydropiperoides* and *Potamogeton Nuttallii*. The lengthening shadows warned us that it was time to suspend operations, and further investigation was abandoned until next day.

Early the following morning we were out on the lake, getting a good supply of things that had merely been sampled the day before, and looking out for new treasures. *Cicuta bulbifera*, *Bœhmeria cylindrica*, a form of *Bidens cernua* which I have seen nowhere else, and *Coreopsis discoidea*, held sway over a patch of peat. *Aster undulatus*, with larger flowers than usual, and thin, broad leaves, several forms of *A. cordifolius*, *A. lateriflorus*, var. *hirsuticaulis*, a small flowered form of *Solidago arguta*, and a form of the exceedingly variable *Ilex verticillata* were collected. In the hasty search over a field, only one plant of *Gnaphalium decurrens* was found, but on the edge of the woods were good fruiting specimens of *Quercus Muhlenbergii*, var. *humilis*, and *Betula lenta*. A good-sized tree of *Pyrus nigra* was looked for, but absence of fruit and the lateness of the hour prevented us from making a thorough search. This tree, observed in 1890, is twenty or twenty-five feet high, and worthy of being included in Prof. Sargent's Silva. A hurried tramp through the woods added *Pyrola secunda*, *P. elliptica*, and what is probably *P. uliginosa*, and fine specimens of *Asplenium platyneuron*.

Altogether, 156 species were observed, with 82 on the list of actual collection. Many more might have been added, but lack of time prevented. As far as I have been able to learn, no other persons have botanized in this portion of the county, or, indeed, in any other part, unless in the extreme northeastern end about Pittston. Thorough exploration of other portions will undoubtedly yield a rich and interesting flora. On the right bank of the river, scattered about in the Catskill formation, are six or eight small lakes, and one larger one called Harvey's Lake. Some five or six miles east of Long Pond are two lakes, known locally as Mud Pond and Three-Cornered Pond, and about ten miles east of these, not far from the Lehigh Valley Railroad, is a nameless lake, the largest in the county. Just east of this lake is an elevated section of Pocono sandstone, which must have a flora very similar to that of the Pocono, as it is merely a western extension of that interesting region.

The total number of species collected in the county thus far is 325, about one-fifth of the number that ought to be found.

LIST OF SPECIES COLLECTED.

Clematis Virginiana, L. Above Berwick.
Anemone Virginiana, L. Above Berwick.
Hepatica triloba, Chaix. Pond Hill.
Ranunculus acris, L. Above Berwick.
Ranunculus reptans, L. Above Berwick.
Isopyrum trifolium (L.) Britton. Long Pond.
Actæa alba (L.) Mill. Long Pond.
Cimicifuga racemosa (L.) Nutt. Pond Hill.
Liriodendron Tulipifera, L. Pond Hill.
BRASENIA PURPUREA (Michx.) Long Pond.
    Hydropeltis purpurea, Michx. Fl. Bor. Amer. 324, t. 29 (1803).
    Brasenia peltata, Pursh, Fl. Amer., Sept. 389 (1814).
Nymphæa advena, Soland. Long Pond.

Castalia odorata (Dryand) Woodv. & Wood. Long Pond.
Sarracenia purpurea, L. Long Pond.
NECKERIA SEMPERVIRENS (L.) Long Pond.
  Fumaria sempervirens, L. Sp. Pl. 700 (1753).
  Corydalis glauca, Pursh, Fl. Amer. Sept. 463 (1814).
Nasturtium hispidum (Desv.) DC. Above Berwick.
Arabis Canadensis, L. Long Pond.
Arabis lyrata, L. Pond Hill.
Lepidium Virginicum, L. Long Pond.
Lechea Leggettii, Britton & Hollick. Pond Hill.
Viola palmata, L. Pond Hill.
Polygala verticillata, L. Long Pond.
Silene stellata (L.) Ait. Nescopeck.
Cerastium vulgatum, L. Above Berwick.
Stellaria uliginosa, Murr. Above Nescopeck.
Tissa rubra (L.) Britton. Above Berwick.
Hypericum Ascyron, L. Above Berwick.
Hypericum ellipticum, Hook. Above Nescopeck.
Hypericum maculatum, Walt. Above Berwick.
Hypericum mutilum, L. Long Pond.
Hypericum perforatum, L. Above Berwick.
Hypericum Virginicum, L. Long Pond.
Tilia Americana, L. Above Berwick.
Geranium maculatum, L. Long Pond.
Oxalis stricta, L. Pond Hill.
Impatiens aurea, Muhl. Pond Hill.
Ilex verticillata (L.) A. Gray. Long Pond.
Ilex verticillata, var. *padifolia* (Willd.) T. & G. Long Pond.
Nemopanthes mucronata (L.) Trelease. Long Pond.
Ceanothus Americanus, L. Pond Hill.
Vitis cordifolia, Michx. Above Berwick.
Acer saccharinum, L. Long Pond.
Rhus glabra, L. Above Berwick.
Rhus radicans, L. Pond Hill.
Rhus typhina, L. Above Berwick.
Melilotus alba, Lam. Above Berwick.
Trifolium arvense, L. Long Pond.
Meibomia Canadensis (L.) Kuntze. Above Berwick.
Lespedeza hirta (L.) Ell. Pond Hill.
Lathyrus palustris, L. Above Berwick.
Amphicarpæa comosa (L.) Ridd. Above Berwick.
Apios tuberosa, Mœnch. Above Berwick.
Cassia nictitans, L. Above Berwick.
Prunus Americana, Marsh. Above Berwick.
Spiræa rubra (Mill.) Britton. Above Berwick.
Spiræa salicifolia, L. Nescopeck, Long Pond.
Spiræa tomentosa, L. Long Pond.

Rubus Canadensis, L. Long Pond.
Rubus hispidus, L. Long Pond.
Rubus villosus, Ait. Above Berwick.
Rubus villosus, var. *montanus*, Porter. Long Pond.
Geum Canadense, Jacq. Above Berwick.
Potentilla Canadensis, L. Pond Hill.
Rosa Carolina, L. Long Pond.
Rosa humilis, Marsh. Above Berwick.
Pyrus nigra (Marsh.) Sargent. Long Pond.
Hydrangea arborescens, L. Above Nescopeck.
Sedum acre, L. Above Berwick.
Drosera intermedia, Drev. & Hayne., var. *Americana*, D. C. Long Pond.
Drosera rotundifolia, L. Long Pond.
Proserpinaca palustris, L. Long Pond.
Nesæa verticillata (L.) H.B.K. Long Pond.
Epilobium coloratum, Muhl. Above Berwick.
Epilobium spicatum, Lam. Nescopeck.
Œnothera fruticosa, L. Long Pond.
Œnothera biennis, L. Pond Hill.
Œnothera pumila, L. Above Berwick.
Hydrocotyle Americana, L. Above Berwick.
Cicuta bulbifera, L. Long Pond.
Sium cicutæfolium, Gmel. Long Pond.
Angelica villosa (Walt.) B.S.P. Pond Hill.
Aralia racemosa, L. Long Pond.
Cornus alternifolia, L. Pond Hill.
Cornus circinata, L'Hér. Pond Hill.
Cornus florida, L. Long Pond.
Sambucus Canadensis, L. Above Nescopeck.
Sambucus pubens, Michx. Above Berwick.
Viburnum acerifolium, L. Pond Hill.
Viburnum dentatum, L. Long Pond.
Cephalanthus occidentalis, L. Long Pond.
Mitchella repens, L. Long Pond.
Galium asprellum, Michx. Above Berwick.
Galium circæzans, Michx. Long Pond.
Galium lanceolatum, Torr. Above Nescopeck.
Galium triflorum, Michx. Long Pond.
Eupatorium ageratoides, L. f. Pond Hill.
Eupatorium purpureum, L. Pond Hill.
Solidago arguta, Ait. Long Pond.
Solidago bicolor, L. Pond Hill.
Solidago cæsia, L. Pond Hill.
Solidago Canadensis, L. Pond Hill.
Solidago juncea, Ait. Pond Hill.
Solidago lanceolata, L. Pond Hill.
Solidago latifolia, L. Pond Hill.

Solidago nemoralis, Ait. Pond Hill.
Solidago rugosa, Mill. Pond Hill.
Solidago rupestris, Raf. Pond Hill.
Solidago serotina, Ait. Above Berwick.
Solidago squarrosa, Muhl. Pond Hill.
Aster acuminatus, Michx. Lond Pond.
Aster concinnus, Willd. Long Pond.
Aster cordifolius, L. Pond Hill.
Aster cordifolius, L., var. *lanceolatus*, Porter. Long Pond.
Aster corymbosus, Ait. Long Pond.
Aster ericoides, L. Pond Hill.
Aster infirmus, Michx. Pond Hill.
Aster lateriflorus (L.) Britton, var. *hirsuticaulis* (Lindl.), Millsp. Long Pond.
Aster linariifolius, L. Long Pond.
Aster Novæ-Angliæ, L. Pond Hill.
Aster paniculatus, Lam. Pond Hill.
Aster patens, Ait. Long Pond.
Aster patens, var. *phlogifolius* (Muhl.) Nees. Long Pond.
Aster prenanthoides, Muhl. Pond Hill.
Aster undulatus, L. Long Pond.
Erigeron Canadensis, L. Long Pond.
Anaphalis margaritacea (L.) Benth. & Hook. Long Pond.
Gnaphalium decurrens, Ives. Long Pond.
Gnaphalium obtusifolium, L. Long Pond.
Gnaphalium purpureum, L. Long Pond.
Gnaphalium uliginosum, L. Long Pond.
Polymnia Canadensis, L. Pond Hill.
Coreopsis discoidea, T. & G. Long Pond.
Bidens frondosa, L. Pond Hill.
Bidens cernua, L. Long Pond.
Achillæa Millefolium, L. Long Pond.
Chrysanthemum Leucanthemum, L. Long Pond.
Artemisia Pontica, L.? Long Pond.
Erechtites hieracifolia (L.) Raf. Long Pond.
Cacalia atriplicifolia, L. Pond Hill.
Cacalia suaveolens, L. Nescopeck.
Carduus lanceolatus, L. Long Pond.
Hieracium venosum, L. Long Pond.
Lactuca Canadensis, L. Above Berwick.
Prenanthes altissima, L. Long Pond.
Prenanthes Serpentaria, Pursh. Long Pond.
Lobelia cardinalis, L. Long Pond.
Lobelia inflata, L. Long Pond.
Lobelia spicata, Lam. Above Berwick.
Lobelia syphilitica, L. Pond Hill.
Campanula aparinoides, Pursh. Above Nescopeck.
Campanula rotundifolia, L. Above Berwick.

Gaylussacia frondosa (L.) T. & G. Long Pond.
Vaccinium corymbosum, L., var. *amœnum* (Ait.) A Gray. Long Pond.
Vaccinium disomorphum, Bigel. Long Pond.
Vaccinium stamineum, L. Long Pond,
Vaccinium vacillans, Soland. Long Pond.
Oxycoccus macrocarpus, Pers. Long Pond.
Gaultheria procumbens, L. Long Pond.
Epigæa repens, L. Long Pond.
Kalmia angustifolia, L. Long Pond.
Kalmia latifolia, L. Pond Hill.
Azalea nudiflora, L. Long Pond.
Rhododendron maximum, L. Above Nescopeck.
Pyrola chlorantha, Sw. Above Nescopeck.
Pyrola elliptica, Nutt. Long Pond.
Pyrola rotundifolia, L. Long Pond.
Pyrola secunda, L. Long Pond.
Pyrola uliginosa, Torr.? Long Pond.
Chimaphila umbellata (L.) Nutt. Pond Hill.
Hypopitys Monotropa, Crantz. Long Pond.
Lysimachia quadrifolia, L. Above Nescopeck.
Lysimachia terrestris (L.) B.S.P. Above Berwick.
Steironema ciliatum (L.) Raf. Above Berwick.
Asclepias exaltata (L.) Muhl. Pond Hill.
Asclepias obtusifolia, Michx. Above Berwick.
Sabbatia angularis (L.) Pursh. Above Berwick.
Gentiana quinquefolia, L. Pond Hill.
Bartonia Virginica (L.) B.S.P. Long Pond.
Phlox maculata, L. Above Berwick.
Phlox paniculata, L. Long Pond.
Phlox subulata, L. Long Pond.
Myosotis laxa, Lehm. Above Berwick.
Cuscuta Gronovii, Willd. Above Berwick.
Physalis Virginiana, Mill. Above Berwick.
Scrophularia nodosa, L., var. *Marylandica* (L.) A. Gray. Pond Hill.
Chelone glabra, L. Above Berwick.
Mimulus ringens, L. Above Berwick.
Gratiola Virginiana, L. Above Berwick.
Ilysanthes gratioloides (L.) Benth. Above Berwick.
Veronica Americana, L. Above Berwick.
Veronica officinalis, L. Long Pond.
Veronica scutellata, L. Above Berwick.
Veronica Virginica, L. Nescopeck.
Gerardia pedicularia, L. Pond Hill.
Gerardia tenuifolia, Vahl. Long Pond.
Melampyrum lineare, Lam. Above Nescopeck.
Utricularia gibba, L. Long Pond.
Utricularia vulgaris, L. Long Pond.

Dianthera Americana, L. Above Berwick.
Verbena hastata, L. Pond Hill.
Verbena urticæfolia, L. Pond Hill.
Mentha Canadensis, L. Above Berwick.
Mentha piperita, L. Pond Hill.
Mentha viridis, L. Above Berwick.
Cunila Mariana, L. Pond Hill.
Kœllia lanceolata (Pursh) Kuntze. Above Berwick.
Lycopus Europæus, L. Above Berwick.
Lycopus sinuatus, L. Pond Hill.
Lycopus Virginicus, L. Nescopeck.
Hedeoma pulegioides (L.) Pers. Long Pond.
Melissa officinalis, L. Long Pond.
Monarda fistulosa, L., var. *rubra*, A. Gray. Nescopeck.
Scutellaria galericulata, L. Long Pond.
Scutellaria lateriflora, L. Long Pond.
Physostegia Virginiana (L.) Benth. Above Nescopeck.
Trichostema dichotomum, L. Nescopeck.
Teucrium Canadense, L. Nescopeck.
Polygonum arifolium, L. Long Pond.
Polygonum emersum (Michx.) Britton. Long Pond.
Polygonum Hydropiper, L. Pond Hill.
Polygonum hydropiperoides, Michx. Long Pond.
Polygonum Pennsylvanicum, L. Pond Hill.
Polygonum punctatum, Ell Long Pond.
Polygonum sagittatum, L. Pond Hill.
Polygonum Virginianum, L. Long Pond.
Fagopyrum esculentum, Mœnch. Nescopeck.
Sassafras officinale, Nees. Long Pond.
Euphorbia hypericifolia, L. Pond Hill.
Bœhmeria cylindrica (L.) Willd. Long Pond.
Juglans nigra, L. Pond Hill.
Myrica asplenifolia (L.) Banks. Pond Hill.
Betula lenta, L. Long Pond.
Betula lutea, Michx. f. Pond Hill.
Betula nigra, L. River bank, near Pond Hill.
Betula populifolia, Marsh. Long Pond.
Alnus incana (L.) Willd. Long Pond.
Alnus serrulata, Willd. Long Pond.
Carpinus Virginiana (Marsh.) Sudworth. Pond Hill.
Quercus alba, L. Pond Hill.
Quercus Muhlenbergii, Engelm., var. *humilis* (Marsh.) Britton. Long Pond
Quercus Prinus, L. Pond Hill.
Salix cordata, Muhl. Above Berwick.
Salix tristis, Ait. Long Pond.
Populus grandidentata, Michx. Long Pond.
Leptorchis liliifolia (L.) Millsp. Long Pond.

Corallorhiza multiflora, Nutt. Long Pond.
Gyrostachys cernua (L.) Kuntze. Pond Hill.
Gyrostachys gracilis (Bigel.) Kuntze. Nescopeck.
Peramium pubescens (Willd.) Morong. Long Pond.
Pogonia ophioglossoides (L.) Ker. Long Pond.
Habenaria lacera (Michx.) R. Br. Lond Pond.
Habenaria psycodes (L.) A. Gray. Long Pond.
Habenaria tridentata (Willd.) Hook. Long Pond.
Cypripedium pubescens, Willd. Long Pond.
Dioscorea villosa, L. Long Pond.
Iris versicolor, L. Above Berwick.
Smilax rotundifolia, L. Long Pond.
Polygonatum biflorum (Walt.) Ell. Pond Hill.
Unifolium Canadense (Desf.) Greene. Long Pond.
Unifolium racemosum (L.) Britton. Pond Hill.
Lilium Philadelphicum, L. Long Pond.
Uvularia perfoliata, L. Long Pond.
Uvularia sessilifolia, L. Long Pond.
Medeola Virginica, L. Long Pond.
Pontederia cordata, L. Long Pond.
Xyris Caroliniana, Walt. Long Pond.
Juncus acuminatus, Michx. Above Berwick.
Juncus pelocarpus, E. Meyer. Long Pond.
Arisæma triphyllum (L.) Torr. Pond Hill.
Acorus Calamus, L. Above Berwick.
Alisma Plantago, L., var. *triviale* (Pursh) B. S. P. Above Berwick.
Sagittaria graminea, Michx. Long Pond.
Sagittaria variabilis, Engelm., forma *gracilis* (Pursh) Britton.
Potamogeton Nuttallii, Cham. Long Pond.
Potamogeton pusillus, L. Long Pond.
Eriocaulon septangulare, With. Long Pond.
Dulichium spathaceum (L.) Pers. Long Pond.
Eleocharis acicularis (L.) R. & S. Long Pond.
Eleocharis olivacea, Torr. Long Pond.
Eleocharis palustris (L.) R. & S. Long Pond.
Rhynchospora alba (L.) Vahl. Long Pond.
Carex intumescens, Rudge. Pond Hill.
Carex lurida, Wahl. Pond Hill.
Panicum dichotomum, L. Nescopeck.
Panicum scoparium, Lam. Nescopeck.
Panicum virgatum, L. Above Berwick.
Andropogon provincialis, Lam. Above Berwick.
Agrostis perennans (Walt.) Tuck. Long Pond.
Bromus secalinus, L. Above Berwick.
Hystrix patula, Mœnch. Long Pond.
Pinus rigida, Mill. Pond Hill.
Pinus Strobus, L. Pond Hill.

Tsuga Canadensis (L.) Carr. Pond Hill.
Lycopodium annotinum, L. Pond Hill.
Lycopodium inundatum, L. Long Pond.
Lycopodium lucidulum, Michx. Long Pond.
Ophioglossum vulgatum, L. Long Pond.
Botrychium ternatum (Thunb.) Sw., var. *obliqum* (Muhl.) Milde. Pond Hill.
Botrychium Virginianum (L.) Sw. Long Pond.
Polypodium vulgare, L. Nescopeck.
Pteris aquilina, L. Long Pond.
Adiantum pedatum, L. Long Pond.
Asplenium Filix-fœmina (L.) Bernh. Long Pond.
Asplenium platyneuron (L.) Oakes. Long Pond.
Asplenium Trichomanes, L. Pond Hill.
Camptosorus rhizophyllus (L.) Link. Pond Hill.
Phegopteris connectilis (Michx.) BSP. Long Pond.
Phegopteris Dryopteris (L.) Feé. Pond Hill.
Phegopteris hexagonoptera (L.) Feé. Long Pond.
Dryopteris acrostichoides (Michx.) Kuntze. Long Pond.
Dryopteris Novaboracensis (L.) A. Gray. Long Pond.
Dryopteris dilatata (Sw.) A. Gray. Long Pond.
Dryopteris Thelypteris (L.) A. Gray. Long Pond.
Cystopteris fragilis (L.) Sw. Pond Hill.
Onoclea sensibilis, L. Above Berwick.
Woodsia Ilvensis (L.) R. Br. Pond Hill.
Woodsia obtusa (Spreng.) Torr. Long Pond.
Dicksonia punctilobula (Michx.) A. Gray. Long Pond.
Osmunda regalis, L. Long Pond.
Equisetum limosum, L.? Long Pond.
Equisetum sylvaticum, L. Above Berwick.

On Rusbya, a New Genus of Vacciniaceæ from Bolivia.

By N. L. Britton.

Among the most interesting features of the vegetation of the the Eastern Cordillera of the Andes is the group of epiphytic genera of Vacciniaceæ. Dr. Rusby obtained a number of them, and those here described are different from the rest in the presence of stipules, a feature hitherto unrecorded in either Ericaceæ or Vacciniaceæ. The genus here proposed will in a measure commemorate his arduous and eminently successful work in exploring a difficult region, and one hardly before visited by a botanist.

RUSBYA, gen. nov.

Calyx tube continuous with the peduncle; campanulate, 5-angled; the limb erect, 5-lobed; lobes triangular, acute or acuminate; corolla tubular, narrowed above; stamens 10, nearly equalling the corolla; flowers otherwise as in *Themistocleia* Klotsch.

Glabrous or minutely pubescent epiphytic shrubs, with slender, densely leafy branches; branchlets distinctly marked by the leaf-scars; leaves coriaceous, short-petioled, linear or ovate, obtuse, minutely apiculate, stipulate; stipules persistent, setaceous; flowers small, solitary, slender-peduncled; peduncles minutely bracted near the base.

Two species, natives of Eastern Bolivia:

1. R. TAXIFOLIA.—Branchlets glabrous; leaves narrowly linear, one-nerved; peduncles 2 or 3 bracteate above the base.

   Yungas, Bolivia, Rusby, No. 2692; M. Bang, No.

2. R. PEARCEI.—Branchlets pubescent; leaves ovate or ovate-lanceolate, pinnately nerved or indistinctly 3-nerved; peduncles 1 or 2 bracteate at the base; flowers red.

   Pintae (Pintoe), Bolivia, 10,000–11,000 ft., R. Pearce, Feb. 1867, Herb. Kew.; 4–6 ft. long on trees, Sandillani, 8,000–9000 ft., 1866, R. Pearce, Herb. Kew. Sir Joseph Hooker notes the presence of stipules on one of these Kew sheets.

Botanical Notes.

A New Station in New York State for Saxifraga aizoides, L.—This plant has been recorded as growing in but three or four places in this State. During a collecting trip, I found the plant growing in considerable abundance upon the dripping cliffs below the falls in Salmon River, Town of Orwell, Oswego Co. The nearest station known is the east branch of Fish Creek, Oneida Co., twenty miles away, where it was discovered many years ago by Knieskern and Vasey, and observed later by John A. Paine, Jr. (Cat. of Plants found in Oneida Co. and Vicinity 1865, p. 31). The west branch of Fish Creek and Salmon River have their sources very near together; the former, however, flows south into Oneida Lake; the latter, west into Lake Ontario. Salmon River falls (110 ft. high) are in the south-eastern part of the town of Orwell. The river, at the place where the fall occurs, flows west, exposing the face of the cliff upon the north side of the ravine to the sun. It is upon this sunny southern exposure that the plant in question grows. A few plants were still flowering September 9, 1892. The mist from the falls and the water from the dripping rocks above keep the atmosphere moist and cool.

Potentilla fruticosa also grows pendent from the rocks with the Saxifrage, and at a distance somewhat resembles it.

Primula Mistassinica also occurs in the same place.

I searched very carefully for *Pinguicula vulgaris* but was unable to detect it, and have since found out that while it has been found at Taughhannock and at Portage with *Saxifraga* it has not been reported from the Fish Creek station. W. W. Rowlee.

An International Botanical Congress.—Since the meeting of the botanists at Rochester, last August, it has become evident that an International Botanical Congress should be held in 1893 in this country. Upon the return of Professor Underwood from Genoa, with his report of what was done there, as well as of what was left undone, such a Congress seemed a necessity, especially when it was learned that the delegates to the Genoa Congress expected one to be held in America this year, in order to complete the work left by them. The Columbian Exposition will doubtless bring many botanists to this country during the year. Most of these will attend our scientific meetings, if possible, and it seems wise to take advantage of this, and to arrange for a formal Congress. There being no committee to take charge of the work of preparing for the Congress, after a consultation with a number of botanists, it was thought advisable that the chairman of the Section of Botany of the American Association for the Advancement of Science, and the President of the Botanical Club, Dr. Wilson, should appoint a committee to take the matter in hand. Accordingly, on December 9th, notices were sent to the following gentlemen with the request that they serve on such committee: J. C. Arthur, L. H. Bailey, N. L. Britton, D. H. Campbell, J. M. Coulter, B. T. Galloway, Conway MacMillan, B. L. Robinson, William Trelease, L. M. Underwood, George Vasey.

May I not ask that a hearty support be given to the committee by every botanist, to the end that the Congress may be every way successful.

CHARLES E. BESSEY,
Chairman Section G (Botany) A. A. A. S.

Amarantus blitoides, S. Watson. During last summer (1892) I discovered a single plant of *Amarantus blitoides*, growing along the track of the C. R. R. of N. J., about a-half mile south of the Sewaren, N. J., station on Long Branch Division. This plant is new to the 100-mile range, and the seed had evidently been brought by the cars. The plant was large and full of bloom, so that, no doubt, the locality will be permanently established. This species belongs in the far West, but I believe it has been reported by D. F. Day, as introduced into the neighborhood of Buffalo, N. Y. Professor Halsted tells me that he has seen it about New Brunswick, N. J.

L. H. LIGHTHIPE.

Viburnum prunifolium, L. var. *globosum*; Geo. V. Nash, n. var.—This differs from the type in several particulars. The most conspicuous one is in the fruit, which is globose, and but little more than half as large—about $\frac{5}{16}$ of an inch. It differs also in the smaller cymes, and in its divaricately branching habit. The specimen I found only grew five or six feet high. The flowers appear before the leaves, and it was this which first drew my attention to it, and led me to watch it for further differences.

Others may have found this variety also, and it is only reasonable to suppose they have. I found it in a section where the type grows in abundance, and it is strange that this variety has never been noted before. There is nothing in the Columbia College Herbarium like it, nor do I find reference in any work to such a form.

GEO. V. NASH.

CLIFTON, N. J., Dec. 12, 1892.

Proceedings of the Club.

TUESDAY, JANUARY 10, 1893.

Annual meeting. The president in the chair and twenty-eight persons present.

The committee appointed to draw up resolutions on the life and works of Professor John Strong Newberry, submitted the following:

Resolved, That in the death of Dr. Newberry the Torrey Botanical Club has lost an invaluable leader and friend. He was for ten years our president. Under his inspiring leadership the Club was greatly enlarged in numbers, in the scope of its aims, and in its scientific work. From his earliest days he followed assiduously the paths of science in many fields and in many ways; as student, as traveller, as explorer, as collector, as author, investigator, organizer and teacher. He was eminent in all, but especially in his favorite pursuits of Geology, Palæontology and Botany. He united many of the qualities of the greatest scientists; an inextinguishable thirst for knowledge, an enthusiastic love of nature, indefatigable industry, keen and wide observation, an exact and retentive memory, and a reflecting and discriminating judgment, that pondered and weighed with calm and philosophic care all questions, great and small, which a vast accumulation of material in a life of reading, study and observation, brought to the tribunal of his philosophic judgment. These great qualities enabled him to do much for Science, and, added to great aptness and facility in lucid exposition, placed him among the foremost of instructors. We owe his memory an endless obligation. At the meetings of the Club he contributed information on every branch of Botany, stimulating inquiry, and enriching his remarks from vast stores of information, drawn from many fields of scientific research, and from the recollections of extensive travels, in which nothing observed seemed ever forgotten.

Personally, he was the most charming of associates, the warmest and most loyal of friends. Many a young student will miss the encouragement of his suggestions, and older ones the advantages of his gentle and helpful criticisms. He will be remembered as scholar, thinker, investigator, and educator; a most true gentleman, a noble intellect, a great heart overflowing with the broadest charity.

Resolved, That the sympathies of the Club be extended to the widow and family of the deceased; and that a copy of these resolutions be forwarded to them, and entered upon the minutes of the Club.

Committee { ADDISON BROWN,
N. L. BRITTON.

Dr. Rusby announced the death on December 30, of Mr. Thomas Hogg, long an active member of the Club, and for many years one of its Vice Presidents, and remarked on his life and valuable services to American Botany and especially to Horticulture. The President referred to the great loss which the Club had sustained, both in a scientific and a social way. It was resolved that a Committee of three be appointed by the President to prepare suitable resolutions. The President appointed as such Committee, Mr. E. S. Miller, Mr. Arthur Hollick, Rev. L. H. Lighthipe.

A letter from Prof. C. Henry Kain announced the sudden death in Camden, N. J., of Mr. I. C. Martindale, one of the Club's most distinguished corresponding members, and gave a brief sketch of his life and works. The President remarked upon his personal acquaintance with Mr. Martindale and testified to his high personal qualities and scientific attainments.

Mr. A. A. Heller, of Lancaster, Pennsylvania, was elected an active member.

Reports of the officers for last year were presented and accepted. The Recording Secretary reported 168 active members on the roll, an increase of 25 during the year; the average attendance at regular meetings was 27. The Treasurer reported the total income of the Club during the year as $1448.24. The Editor reported that the number of pages in the 19th volume of the BULLETIN, published during the year, was 392, an increase over the preceding volume of 12 pages; No. I. of the 3d volume of the MEMOIRS was issued in February; No. II., containing Dr. Morong's revision of the North American Naiadaceæ, is in press. The Curator reported 3,492 specimens in the Herbarium, all from within the 100-mile circle.

The following officers for the year 1893 were then unanimously elected:

President, Hon. Addison Brown; Vice-Presidents, Dr. Timothy F. Allen and Dr. Thomas Morong; Treasurer, Mr. Henry Ogden; Recording Secretary, Dr. H. H. Rusby; Corresponding Secretary, Mr. John K. Small; Editor, Dr. N. L. Britton; Associate Editors, Dr. Emily L. Gregory, Miss Anna Murray Vail, Mr. Arthur Hollick, Prof. Byron D. Halsted, Mr. A. A. Heller; Curator, Miss Josephine E. Rogers; Librarian, Miss Effie A. Southworth.

The President appointed the following standing committees: Committee on Finance, Mr. Justus F. Poggenburg, Mr. Wm. H. Rudkin; Committee on Admissions, Mr. M. M. Le Brun, Mrs. S. B. Clarke; Library and Herbarium Committee, The Curator, the

Libarian, Miss C. A. Timmerman, Rev. L. H. Lighthipe; Committees on the Local Flora, Phanerogamia, Dr. Thomas C. Porter, Dr. N. L. Britton, Dr. H. H. Rusby; Cryptogamia, Elizabeth G. Britton, Maria O. Le Brun, Dr. Smith Ely Jelliffe.

Prof. Byron D. Halsted read the announced paper of the evening, "Some Results of a Study of Fruit Decays," illustrated by diagrams. An abstract of the paper will be published in a subsequent number of the BULLETIN. Prof. Halsted exhibited a set of his distribution of 100 species of American weed-seeds, an account of which appears in the present BULLETIN.

Mr. Lighthipe exhibited *Amarantus blitoides* from Sewaren, N. J. (See note on p 70)

WEDNESDAY, JANUARY 25TH.

Dr. Morong in the Chair and 29 persons present. Dr. Britton was elected Secretary *pro. tem.*

Prof. H. W. Conn, of Wesleyan University, was elected an active member.

The following papers were read and illustrated by specimens and maps:

"Some new Species of Characeæ," by Dr. T. F. Allen (to be published in a subsequent number of the BULLETIN).

"Preliminary Report on the Flora of Luzerne County, Penna.," by Mr. A. A. Heller (published in the present BULLETIN).

"The Mosses of White Top Mountain, Virginia," by Mrs. N. L. Britton. This will be incorporated in the account of the exploration of Southern Virginia prosecuted during the last summer, to be published in a number of the MEMOIRS.

The Secretary stated that the memorial of Dr. Newberry would be presented at the second February meeting, and that Mr. J. H. Redfield had prepared an article on the life of Mr. I. C. Martindale, which would be printed in the March BULLETIN.

Reviews of Foreign Literature.

A Monograph of the Myxogastres. By George Massee. (Methuen & Co., London, 1892. 359 pages and 12 chromo lithograph plates containing 313 figures.)

An introductory portion, occupying twenty-seven pages, is occupied by a discussion of the affinities and classification of the group. De Bary's statement regarding want of relationship between this group and the fungi are matched off against each other and finally dismissed as self-contradictory.

The writer then draws a parallel between the methods of growth in the Myxomycetes and Mucorini, and judges that this is sufficient to indicate affinities, quoting from De Bary: "We find it impossible to establish any strict homologies, but are limited to resemblances in form, structure and mode of life." That the similarities are sometimes striking cannot be denied, but that they should be interpreted as indicating affinity (community of descent) is by no means clear. It may be that Mr. Massee is acquainted with some other kind of affinity, not involving descent, and that the groups under discussion have this kind; indeed, it must be so, for if not there is a direct clash between this part of the discussion and one of his conclusions, which says: "There is no evidence in favour of the supposition that the Myxogastres are degenerated members of the vegetable kingdom, whereas the idea that fungi originated by differentiation from chlorophyll-bearing plant ancestors is generally admitted."

How this very definite and very desirable conclusion was extracted from any part of the previous discussion is an exceeding great mystery, but the curious can find it and four other conclusions, some even more mysterious, drawn up and numbered on page 21.

The introductory portion of the book is, however, as a whole, interesting. The existence of hybrids between species of Myxomycetes is described, and a list given of the colors of the plasmodia of a considerable number of species. Many quotations from various investigators are here collated, and though sometimes used in ways never contemplated by their authors, are still valuable to those to whom the original works are not easy of access. Mr. Massee has settled many important points to his own satisfaction, but has ignored many facts and distinctions which will prevent his conclusions being widely or permanently accepted. For example, the terms sporangium, plasmodiocarp and æthallium, are used with the most thorough indiscrimination. On page 26 *Tubulina cylin-*

drica and fasciculate *Trichiaceæ* are spoken of as æthallia. The six species of *Lycogala* are each described as plasmodiocarp, while the generic characterization begins: "Sporangia æthallioid, grouped together in an intricate manner, and forming a large plasmodiocarp inclosed in a thick, common cortex." These terms might easily have been dropped if there had been no wish to preserve the distinctions which they imply, but no, they are again and again used, with the most bewildering impartiality, all three terms in one sentence describing the same organisms. This condition is, of course, fruitful in peculiarities of classification and arrangement.

It is, however, as a systematic work that this volume might be supposed to have its importance. As the author remarks in the preface, his facilities in the way of material and types were exceptional, and hence the hope of a work of exceptional value was not unwarranted. The typographic beauty of the book increases the anticipated joy of using it, and the plates are the first to convey an idea of the delicate and curious beauty of form and color in this group. Fault has been found with these plates, and especially with the coloring, but it must be said that, as a whole, compared with previous publications, the plates are well calculated to suggest correct ideas of the organisms they represent. And there is another reason why these plates should be praised—they are the one redeeming feature of the book.

It is a most uncomfortable realization that from what might have been a great addition to the literature of one's favorite group there can come only increased confusion, and yet to say that the whole systematic portion of this work is entirely unreliable, and careless to the last degree, is the only way in which the truth can be told. It is the result, no doubt, of much labor, and contains a great and valuable supply of information; in fact, we must take it in spite of its defects as the only comprehensive and recent work on the subject; yet we can never have certainty nor even strong confidence in any statement, no matter how definite. The grossest carelessness pervades it, in the most important as well as the most trivial matters, so that it must be interpreted with the most careful eclecticism.

An amended edition is not likely to be issued, and we must make the best of the present one. As a help in doing this the following remarks and corrections are collated from a copy of the work of which parts have been given practical trial. That the supply of errors is in any way exhausted is not to be supposed, for each attempt at use in determination unearths a large crop of mis-statements and oversights.

In the first place there are hosts of small blunders—typographical errors they might, perhaps, be called, if they were not so numerous and confusing. Errors in the spelling of scientific names occur as follows:

Siphotychium (p. 31, also p. 34), for *Siphoptychium*; *Ellisiana* (p. 98), for *Ellisianum*, to agree in gender with *Lamproderma; robusta* (p. 99), for *robustum; cinera* (p. 150), for *cinerea; Trevelyana* (p. 202), for *Trevelyani*, the original name; *melanospora* (p. 325), for *melanosperma*, the original name; *dealbata* (p. 207), for *dealbatum; Ceinkowskia* (p. 197, p. 307, p. 336 and p. 337, twice), for *Cienkowskia*. In the preface and index this generic name is spelled correctly.

And the arithmetic is no better than the spelling. Of twenty-five genera containing more than one species the number of species is wrongly stated in eight: *Tubulina* 11 (correct number, 12); *Enteridium* 3 (5); *Clathroptychium* 3 (4); *Cribraria* 19 (20); *Stemonitis* 23 (24); *Perichæna* 9 (10); *Ophiotheca* 9 (10); *Badhamia* 18 (17). The author says, "Species 3," under *Reticularia*. As only *R. lycoperdon* appears, we must infer that one species was counted three times, or that the other two were lost, perhaps by the printer. It is, of course, a matter of small importance whether the number of species is correctly given so long as the species are correctly described. The above facts suggest, however, the very important question whether the author was in the same state of mind when he counted (?) the lines on his micrometer as when he failed to count his species.

In the matter of citation of authorities for specific binomials this is a pioneer work. All the systems previously proposed seem to be used in different places, and several new ones. Through this peculiar combination of methods the result is reached that more than a quarter (118 out of 427) of the species have after them the expressive abbreviation "Mass." But all theories fail of a complete explanation of this great massacre of ancient authorities and old friends.

For example, we have *Arcyria cinerea*, Mass. Now Bulliard applied this specific name in 1791, and Schumacher used the binomial in 1803, and nearly all authors since then have recognized this form and name. What is still more remarkable, *A. pomiformis* is reduced to a synonym under *A. cinerea*, though antedating that species by three years. There is also *Stemonitis typhina*, Mass., a binomial applied in the Flora Germanica in 1788. About ten more cases of this kind might be mentioned, where neither the author of the specific name nor of the binomial is cited, but some third party. The general tendency seems to be to recognize the "first name under the genus," but all kinds of tastes in such matters are consulted, as, for instance, *Ophiotheca circumscissa*, Currey (p. 131). According to the synonymy the name Currey used was *chrysosperma*, Wallroth being the author of *circumscissa*, and Rostafinski having first made the present combination.

Those for whom "the first name under the genus" has no special sanctity will write (p. 98) *Lamproderma penetrale* (Cke. & Ellis), instead of "*L. Ellisiana Cke.*" Having decided that *Trichia persimilis*, Karsten, and *T. intermedia*, Massee, are the same, *intermedia* stands as the species, and *persimilis* is down as a synonym, though antedating the other name by twenty-one years.

On page 191, in a note under *Trichia verrucosa*, Berk., is mentioned *T. dictyospora*. No species of this name is described, figured or mentioned in the index. The note in which the name occurs is taken by the author from his "Revision of the Trichiaceæ," and on the same page of that paper, in a note on *T. chrysosperma* is another mention of this name, *dictyospora*, and still another, *T. Archeri*. There seems to be no other mention of these species, which leaves us in doubt as to whether they were lost, strayed, or stolen. It may be that Mr. Massee had intended to apply his name, *Archeri*, to *L. verrucosa*, and *dictyospora*, to *T. Kalbreyeri*, but this is only a guess.

The species published by Rostafinski as *Chondrioderma subdictyospermum* appears as *C. dealbatum* Mass., with a reference to "Didymium dealbatum B. and C., in Herb. Berk. n. 10,756." Concerning this change the author remarks: "There appears to be no good reason why Berkeley's specific name, though only a manuscript one, should have been changed by Rostafinski. Well, if the unreasonableness of supplanting a published name by a "manuscript one" is not evident to Mr. Massee, why did he not restore *Stemonitis trechispora* B. and C. for *S. dictyospora*, Rost., on page 83? Can it be that the cause of this inconsistency was that *dealbatum* could be put into another genus and have "Mass." after it? The fact that "Mass." is written for every cause and no cause preserves us from this suspicion, but leaves us no theory for explaining the difference in the treatment of two exactly parallel cases.

On page 231 is *Didymium neglectum*, Mass. (nov. sp)." The fact that this name had been used by Berkeley for a species considered by our author, (p. 224) to be synonymous with *D. squamulosum*, was perhaps overlooked by him—perhaps not. Considering the variability of *D. farinaceum* the characters on which the new species rests are of very uncertain value, but if it should prove to be distinct it might be well to call it *D. Masseei.*

It is always well to have a species sufficiently described, but *Didymium flavidum*, Peck, is especially honored in being described twice, the first description (p. 247) purporting to be based on an "Authentic specimen from Peck, in Herb., Kew," while the second (p. 251) is a copy of Peck's original description placed under the remark, "Owing to imperfect diagnoses and absence of type specimens, the following cannot be arranged in their respective sections."

Appropriate names are a pleasant aid to the memory, but this is hardly sufficient to justify what we find on page 263, where having decided that three species of *Craterium*, *vulgare*, *pyriforme*, and *minutum*, should be looked upon as one, our author writes them all down as *C. confusum*, Mass.! Well, the species had had eight or ten names before, so that an additional one is a matter of no great importance. Sticklers for priority will probably call the species *C. minutum* (Leers)—if they agree that the three are properly merged. There is another *Craterium minutum* (p. 273) described by Kickx, which name must, of course, be changed.

Physarum compressum is given as a synonym of *P. nefroideum* (p. 286), but later on (p. 291) there is a long discussion as to whether it is not the same as *P. Phillipsii.*

Badhamia varia, Massee (p. 319), is another new name made under the same circumstances as *Craterium confusum*. It includes *Badhamia hyalina, capsulifera, utricularis* and *magna*. The author is probably correct in uniting these species, but his new name will scarcely be accepted in this age of the world.

Even a casual discussion of the classification would occupy so much space that one must be contented merely to state here the opinion that the group *Peritrichiæ* includes organisms having only the most slender geometrical similarities, and that a natural arrangement would compel a division into several orders, coördinate with the other three.

The genera *Licea* and *Lindbladia* are united to *Tubulina*, though these are as well-defined as most of those that remain. The value of a character is to be sought in its constancy, not in its size, and its importance may not be impaired in one group, because it is variable in another. By reason of the fact that the genus *Licea* is no longer recognized, the following note under *Tubulina Lindheimeri* is curious: "The type specimen is so thoroughly crushed that it is impossible to say whether the plant is a *Licea* or a *Tubulina*, but in all probability the latter, as there appear to be indications of the bases of crowded sporangia."

Physarum cæspitosum, Peck, is referred to *Tubulina*. *T. microspora* Cke. (Grevillea, xvi. 116) is not described as a species, nor mentioned as a synonym.

Regarding the validity of Mr. Wingate's family *Orcadellaceæ* the author says: "I am afraid that such trivial characters are admitted as sufficient for family characteristics, those left for generic distinctions will be reduced to inappreciable quantities." This solicitude for generic distinctions is very commendable, but it should not have prevented the realization that *Orcadella* is about as different from its so-called relatives as a Myxomyces without columella and capillitium could well be.

Rostafinski's genus *Heterodictyon* is united, probably with great propriety, to *Cribraria*.

Stemonitis and *Comatricha* are united under the former name. The distinctions previously alleged between these genera were purely imaginary, and it is well not to separate the species until better reasons can be found for so doing

In this group we have a good example of the author's ideas and methods of classification. The major divisions of the Myxomycetes are first (p. 30) called orders, and their divisions sub-orders, but here (p. 69) we have the *Columelliferæ* spoken of as "the present section," and then "the two sub-sections." On page 71 we have the formal headings, "Sub-sect. *Stemonitæ*" and "Sub-sect. *Lamprodemæ*," but no distinctions between the two are alleged. Under the first "sub-sect." are *Stemonitis*, *Siphoptychium*, *Amaurochæte*, *Brefeldia*, *Rostafinskia* and *Reticularia*; under the *Lampródermae* come *Enerthenema*, *Ancyrophorus*, *Lamproderma*, *Echinostelium*, *Raciborskia*, and *Orthotricha*. Under the description of *Lamproderma* we read, "closely allied to *Diachaea* and *Stemonitis*, but differing from both in having the threads of the capillitium originating from the apex of the columella only." On the next page, under the first species, *L. violaceum*; "a very distinct and beautiful species, characterized by having the sporangium flattened and umbilicate, and the almost colorless capillitium springing from every part of the columella." Thus the first species does not possess the only distinctive generic character, and would be a *Stemonitis* if the definitions were strictly applied, and yet, by the arrangement here followed, five genera come between *Lamproderma* and *Stemonitis*, none of which bear any very close relation to either. *Siphoptychium* has been supposed to find its nearest ally in *Tubulina*, and the author goes so far as to suggest its descent from *Tubulina cylindrica*, or some closely allied form, and yet he puts it in another order, between *Stemonitis* and *Amaurochaete*, to neither of which it has any affinity, except the other kind which does not involve descent.

Ancyrophorus is a recently described genus from Denmark, allied to *Enerthenema*, but with the capillitium springing from the upper part of the columella as well as from its discoid apex. There is an undescribed American species.

Orthotricha microcephala, Wingate, has been reduced by Schröter to *Clastoderma Debaryanum*, A. Blytt, but this genus is not mentioned, nor the species either, in the present work, though Schröter's reduction was published in 1889.

If there are any valid distinctions of generic importance between *Raciborskia* and *Orthotricha* they are not made plain by the descriptions, and it is the opinion of Raciborski that the two may prove to be identical, yet in a note after *Orthotricha* Mr. Massee says: "I am not at all convinced in my own mind as to whether the present genus belongs to the present division or to the *Peritricheæ*." Which member of that very heterogeneous group could be imagined to have any affinity with *Orthotricha* is hard to guess, but then affinity seems not to be a necessary qualification for admission into the *Peritricheæ*.

The next "Order," *Calotricheæ* is a rather compact one, but the limits of the included genera are utterly undefined, if we are to believe the author's statements. *Dermodium* is reduced to *Lycogala*, with the suggestion that *D. conicum* is nothing more than *Lycogala epidendrum*. *Hemiarcyria* is reduced to *Arcyria!* To reduce it to *Trichia* would appear warrantable, and to reduce the three genera, and some others, to one, would be consistent, but there is little convenience and less reason in the present arrangement. To keep the number of genera the same, perhaps, we have a new genus, *Heterotrichia*, from South Carolina. All the characters alleged are possessed in greater or less degree by species in other genera. *Hemiarcyria* is a much better genus, in that its characters are more important and constant. *Hemiarcyria Ellisii*, Mass, separated from *H. rubiformis* solely on account of its warted spores, has been re-united with that species.

In only four species of *Trichia* is the number of spirals given. Counting the spirals is rather bothersome business, and the author is apparently not fond of mathematical exercise of this kind; still, he might have given the figures as others have counted them.

Rostafinski's distinction between *Didymium* and *Chondrioderma* was sufficiently flimsy, alleging that the sporangial walls in in *Didymium* always bear *crystals* of lime, while those of *Chondrioderma* have a more or less compacted coating of amorphous *granules*. Reference to crystals is now dropped, leaving the only distinction in the relative compactness of the lime. Under the Rostafinskian method species were sometimes undecided in their generic preferences, but by the new arrangement it will be often difficult to tell where an individual should go, for example, *C.* or *D. spumarioides* is frequently covered above by a smooth plate of lime, while on the sides and base the lime is in the form of scales, or even a fine powder.

Chondrioderma ochraceum, Schröter, has the lime in furfuraceous condition, but for some reason (?) did not go with its relatives into *Didymium*.

Chondrioderma and *Physarum* seem to get very close together. *P. brunneolum* has a polished, porcelain-like wall, and lime in the knots of the capillitium, and what is worse the lime has the form prescribed for *Badhamia!* The next species leans strongly toward *Tilmadoche*, and the second toward *Craterium*.

In the way of variety of terms nothing more would be asked. There is "sporangium," "peridium," "perithecium," "pileus," and "capitulum" (p. 234), though this last seems to be a slip for "capillitium." On page 282, third line from bottom, "capillitium" probably means "columella;" and on 192, eight lines from bottom, "spores" should, to make sense, read "spines."

On page 349, among explanations of plates, "*Cribraria macrocarpa*" seems to be a mistake for "*C. microcarpa*," a very different species.

The index is incomplete, and even the alphabetic arrangement is in places out of joint.

One finds, on referring to the "Descriptions of Figures," that numbers 85 and 86 are "*Badhamia fusea*, Mass." It appears to be a fine species, and we should be glad to know more of it, but alas, there is no more, no *Badhamia*, or other species, of that name, no synonym, nothing in the index. Perhaps it is an error for *fusca*? No, there is a *Stemonitis*, and an *Arcyria*, of that name, but no *Badhamia*.

There are a few remarks which may become classic. Here are two mild samples: "Sometimes two or three sporangia are seated on a common stem, forming a plasmodiocarp." The following concerns *Fuligo varians*: "In the plasmodium condition often occurring amongst dead leaves as a bright yellow soft moss."

Why argue longer about the affinities of the group?

Index to Recent Literature Relating to American Botany.

Aganisia ionoptera (Bot. Mag. t. 7270).

Agave angustissima. J. N. Rose (Gard. and For. vi. 5, 6; illustrated).

Alloplectus Lynchei (Bot. Mag. t. 7271).

Aster turbinellus. (Gard. and For. vi. 16; illustrated).

Black-rot der Reben—Die Bekämpfung der. (B. T. Galloway (Zeitscr. Pflanzenkrank. ii. 257, 258).

Botanical Notes from Texas. E. N. Plank (Gard. and For. vi. 15, 16).

Botanical Section, Rochester Academy of Sciences—Report of. Miss J. H. McGuire. (Proc. Roch. Acad. ii. 44–48).

Record of numerous localities for plants in the vicinity of Rochester, N. Y., among them *Crepis biennis,* shown by Miss Macauley from near Fairport.

Californian Plants—Two new. F. T. Bioletti (Erythea, i. 16, 17). *Gnaphalium bicolor* and *Collinsia Franciscana.*

Catalogue of the Phanerogams and Ferns of Licking County, Ohio. Herbert L. Jones. (Bull. Sci. Lab. Denison University, vii. 1–102, with map).

A neatly printed list of 945 species and varieties, giving habitats, time of flowering and localities for the newer species.

Champia parvula—Development of the Frond from the Carpospore. B. M. Davis (Ann. Bot. vi. 339–353; one plate).

Claytonia—Distribution of the Seed in. J. C. Willis (Ann. Bot. vi. 382, 383; three figures.

Compositæ, Observations on the, I.—Edw. L. Greene (Erythea, i. 1–4).

A discussion of the Tribe Vernoniaceæ. *Stokesia lævis* (Hill) Green is the proper designation of *S. Cyanea,* L'Her.; *Vernonia crinita,* Raf. (1836) must replace *V. Arkansana,* D. C. (1838).

Contributions from the Botanical Laboratory of the University of Pennsylvania. (Vol. i. No. 1, 800, pp. 73; thirteen plates; Philadelphia, 1892).

Another medium for the presentation of the results of botanical research has been inaugurated by the officers of the department of botany in the University of Pennsylvania. The part here noticed was received some weeks ago, and would have been reviewed before but for unusual demand on the time of the editor of the BULLETIN. It contains seven papers (I). a monstrous specimen of *Rudbeckia hirta* by Professor Rothrock, with two plates illustrating a remarkable instance of folial and floral prolification; II. contributions to the history of *Dionæa muscipula,* by Dr. Macfarlane (reviewed by Dr. Bashford Dean in the January BULLETIN) III. An abnormal development of the Infloresconse of *Dionæa*, by Mr. J. W. Harshberger; IV. Mangrove Tannin, by Professor Trimble, a chemical study; V. Observations on *Epigæa repens* by Professor Wilson, a critical investigation of the different kinds of flowers produced by this plant; VI. A Nascent Variety of *Brunella vulgaris*, by Professor Rothrock; VII. Preliminary observations on the movements of the leaves of *Melilotus alba* and other plants, by Professor Wilson, assisted by Jesse M. Greenman, a subject which Prof. Wilson has been investigating for several years. He maintains as one of his principal results that the *hot sun* position, in which leaves point directly towards the sun, is a phenomenon brought about by an endeavor to reduce the amount of transpiration, and is dependent not on light alone, but also to a large degree on heat.

The "Contributions" are a most welcome addition to our list of serial publications, and we hope they may be of frequent appearance. N. L. B.

Echinocactus myriostigma. (Gard. Chron. xii. 789, fig. 120).

Erythea, a Journal of Botany, West American and General. Edited by Willis Linn Jepson and others, of the Department of Botany, University of California.

The remarkable increase in interest in and the study of the Science of Botany during the past few years is well illustrated by the increased number of journals specifically devoted to presenting the results of that study. This is true, both of the Old World and the New. Since 1885 more than fifteen different serial publications have been commenced, and, we believe, all the older ones have been continued, and, for the most part, increased in size and circulation. And it is evident that the end of this process is not yet, for the pressure on the pages of the journals is continually augmenting.

We, therefore, cordially welcome any new enterprise, begun under competent direction, which will facilitate the presentation of botanical information.

No. 1, Vol. i, of "Erythea" is an octavo pamphlet of twenty-eight pages, issued at Berkeley, California, in January, 1893. "Short articles, the results of local investigations in the field and laboratory, will be published in every number, and will give, as is intended, a distinctively West-American character to the journal; it is not the purpose, however, to exclude communications from any part of the world, nor to neglect any department of botanical research."

The number contains two papers by Prof. Greene, and also an adverse criticism by him on Mr. Berthoud's recent paper on the dissemination of plants by the buffalo; two papers by the editor, Mr. Jepson, one by Mr. F. F. Bioletti, and one by Mr. Marshall O. Howe, besides several reviews and a chapter of "Notes and News." The subscription price is $1.50 per year. We presume the journal will be issued monthly, but there is no indication of the frequency of publication in the number which lies before us. N. L. B.

Galax aphylla. (Gard. and For. v. 604, with figure).

Gottsche, Dr. C. M., Obituary. W. H. Pearson (Journ. Bot. xxx. p. 3).

This is a most interesting account of the eminent Hepaticologist, who has contributed so much to the knowledge of the liverworts of Mexico, Central America and the West Indies.

Ipomœa tuberosa.—A Drift seed of. W. B. Hemsley (Ann. Bot. vi. 369–371; one plate).

Record of the finding of the seed of this tropical species on the Hebrides.

Juneberries.—The. G. Nicholson (Garden, xlii. 540–541).

A description of the *Amelanchiers* cultivated in England, accompanied by a colored plate of *A. Canadensis.*

Larrea cuneifolia e sulle Piante bussola.—Sulla. G. Archangeli, (Bull. Soc. Bot. Ital., 1893, 46–48).

Leiophyllum buxifolium. (Garden, xlii. 559; illustrated).

Lichenes Epiphylli Spruceani, a cl. Spruce in regione Rio Negro lecti, additis illis a cl Traill in regione superiore Amazonum lectis. J. Mueller. (Journ. Linn. Soc. xxix. 322–333).

An enumeration of 64 species, with descriptions of new ones in the genera *Lecania*, *Calenia*, *Lecidea*, *Patellaria*, *Lopadium*, *Arthronia*, *Arthroniopsis*, *Strigula* and *Phylloporina.*

Liverworts of West Virginia, A. W. Evans. (Flora of West Virginia, pp. 495–498, reprinted with one plate).

Twenty-eight species are enumerated, including description of

Plagiochila Virginica, n. sp. Owing to the severing of Dr. Millspaugh's connection with the W. Va. Experiment station, the catalogue was printed in haste and errors have crept in; the following may be corrected: *Radula*, Dumortier, not Nees; *Jungermannia*, Micheli, not Michaux; *Plagiochila porelloides*, Lindenberg, not Lindberg. E. G. B.

Mammillaria fissurata. (Gard. Chron. xii. 789, fig. 130.)

Mammillaria Radliaria, n. sp. (Monatsschr. Kakteenk. ii. 104–105; illustrated).

Description of a new species from Mexico.

Melocactus Brongniartii. (Monats. Kakteenk. ii. 88; illustrated).

Mosses of West Virginia Elizabeth G. Britton, (Contributions from the Herbarium of Columbia College, No. 32. Reprinted from the Preliminary Catalogue of the Flora of West Virginia. pp. 484–494, two plates).

Forty-two genera, and eighty-four species are enumerated, mostly gathered in the vicinity of Morgantown in the month of July, 1892. *Dicranodontium Virginicum* and *D. Millspaughii*, are described and figured as new species, the latter replacing *Campylopus flexuosus*, Sull. (Musci. of the U. S. p. 19 not Bridel.) of the Manual. E. G. B.

Mountain Region af Clear Lake.—The. Willis L. Jepson (Erythea, i. 10–16). An account of the flora of the vicinity of this lake, situated in the Coast Range, seventy miles north of the Bay of San Francisco. A number of rare species were secured, and among them two novelties: *Streptanthus hesperidis* and *Arctostaphylos elegans.*

Musci Americæ Septentrionalis, ex operibus novissimis recensiti et methodici dispositi. Renault et Cardot (Revue Bryol. xix. 65–96, 1892, continued).

In the preface the authors claim to have arranged according to their alliance 1350 species of North American mosses, but they do not include those of Mexico or Central America. This list does not claim to be a critical revision, but simply an enumeration to date of all the published species since the issue of the Manual, giving their range geographically, also indicating whether endemic or common to both Europe and the U. S. This first part includes 710 species, the varieties not numbered. We note one error under *Leucobryum*, p. 79, the authors referring *L. sediforme*, Muller as a variety under *L. minus*, Hpe. Either they have misunderstood my statements in the BULLETIN xix, pp. 189–191, or they have recently received material agreeing with Muller's species. We have a portion of this material recently received and entirely agree with Muller that *L. sediforme* does not occur in the United States. E. G. B.

Novitates occidentales, I. Edw. L. Greene (Erythea, i. 4–7).

Pulsatilla multiceps, *Potentilla scopulorum*, *P. ambigens*, *P. Plattensis*, var. (?) *leucophylla*, *P. Micheneri*, *Sanicula nemoralis*, *S. septentrionalis*, *S. saxatilis*, *Senecio Blochmanae* and *Microseris indivisa* are described as new.

Opuntia prolifera (Meehan's Month. iii. 1–2; colored plate).

Plantago media. J. Franklin Collins (Gard. and For. x. 622).

Record of the occurrence of this European species at Providence, R. I.

Preliminary List of the Flowering and Fern Plants of Lorain County, Ohio—Additions to the Albert A. Wright. (Oberlin College, Lab. Bull. No. 1, Suppl., pp. 11, 1893).

A list of 106 species and varieties additional to those recorded in the list of plants of the same area, published by Prof. Wright in 1889, with some corrections, and a number of changes in nomenclature.

Preliminary List of the Mosses of Washington County, Pa. A. Linn and J. S. Simonton (pp. 8, no date [1893]). One hundred species are enumerated.

Salix balsamifera. C. S. Sargent (Gard. and For. vi. 28; illustrated).

Sand-dune Flora of Lake Michigan. E. J. Hill (Gard. and For. vi. 15).

Sarracenia—The History of. M. T. Masters (Gard. Chron. xiii. 11, 12; illustrated).

Dr. Masters gives a very interesting account of the history of our Pitcher-plants, from the time of Lobel (1570).

Sirobasidium, Nouveau Genre d' Hymenomycetes heterobasidies. G. de Lagerheim and N. Patouillard (Journ. de Bot. vi. 465–469; two figures).

Description of this new genus with two new species from Ecuador.

Solanum Seaforthianum. W. Watson (Garden, xlii. 518, 519; colored plate).

A climbing species, native of the West Indies.

Teratological Notes. Marshall A. Howe (Erythea, i. 18, 19).

Record of medium floral prolification in *Leptosyne maritima* and phyllody of pistils in *Trifolium.*

Umbelliferae—Studies in the Californian—I. Willis L. Jepson. (Erythea, i. 8–10).

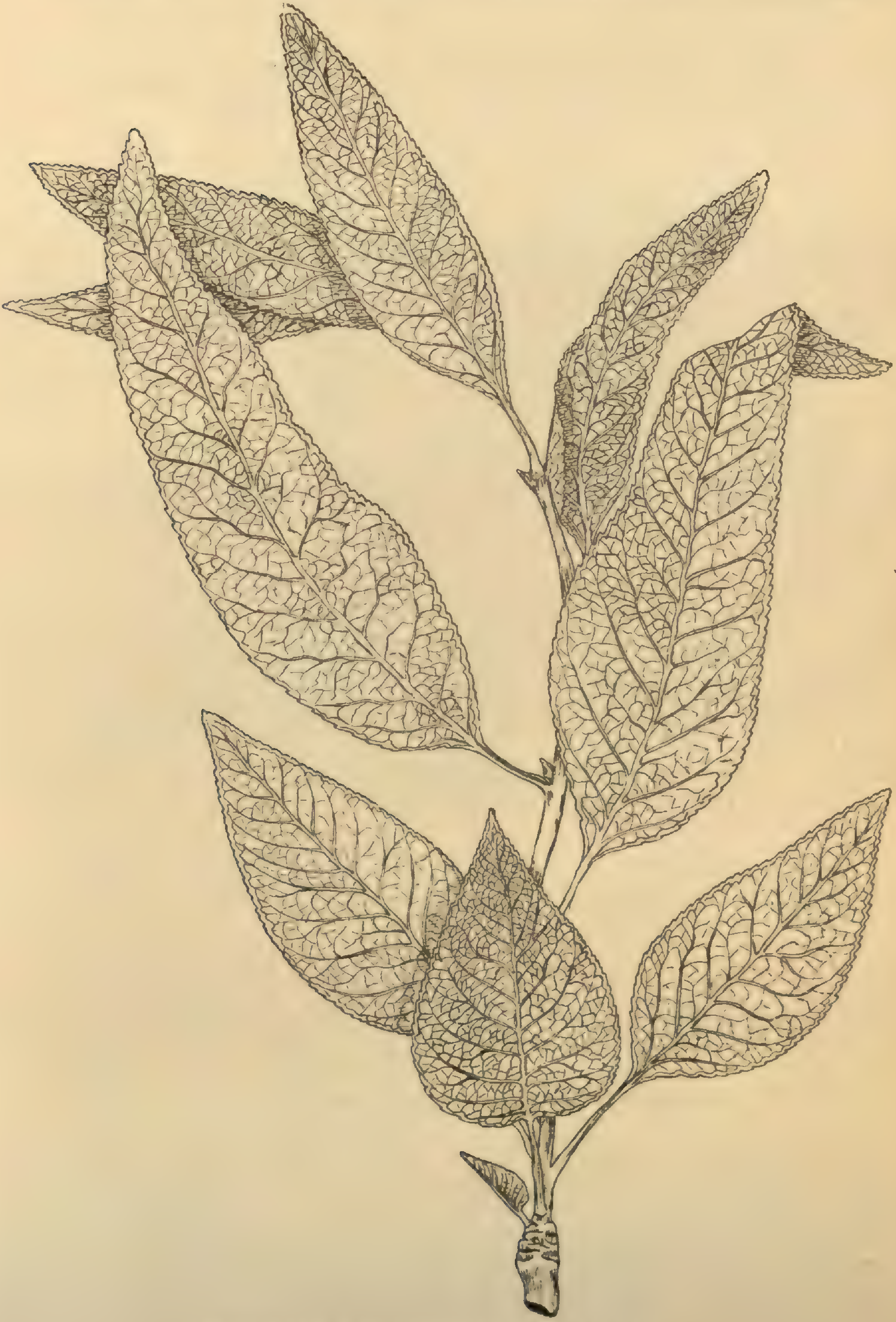
Angelica Californica, Leptotaenia Californica, Nutt., var. *platycarpa* and *Peucedanum robustum* are described as new.

Woody Plants of Manhattan in their Winter Condition. A. S. Hitchcock (pp. 20, Manhattan, Kansas, 1893).

A descriptive list of 48 trees and shrubs. Mr. Hitchcock has followed the code of nomenclature adopted at the Rochester Meeting of the Botanical Club of the A. A. A. S. We note one or two deviations from those rules. *Rhus Canadensis,* Marsh. (1785) is taken as the name of the Canada Sumach, but this is a homonym of *R. Canadensis,* Mill. (1767). *R. aromatica,* Ait. (1789), appears to be the acceptable name. *Symphoricarpos vulgaris,* Michx. (1803), is antedated by *S. orbicularis,* Moench. (1794).

Undescribed plants from Guatemala—X. John Donnell Smith. (Bot. Gaz. xviii. 1–7; one plate.)

Sloanea pentagona, Xanthoxylum foliolosum, Ouratea podogyna, Fuchsia arborescens, var. (?) *megalantha; Hauya Rodriguezii, Hauya Heydeana, Parathesis micrantha, Bumelia pleistochasia, B. leiogyna, Styrax conterminum, Ehretia Luxiana, Juanalloa Sargii, Tynanthus Guatemalensis, Schlegelia cornuta and Ægyphila falcata* are described as new. *Potentilla Donnell-Smithii* Focke, Bot. Gaz. xvi. 3, proves to be *P. heterosepala,* Fritsch. *Juanalloa Sargii* is beautifully figured from one of Mr. Faxon's drawings.



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The Club meets regularly at Columbia College, 49th Street and Madison Avenue, New York City, on the second Tuesday and last Wednesday of each month, except July, August and September, at 8 o'clock, P. M. Botanists are cordially invited to attend.

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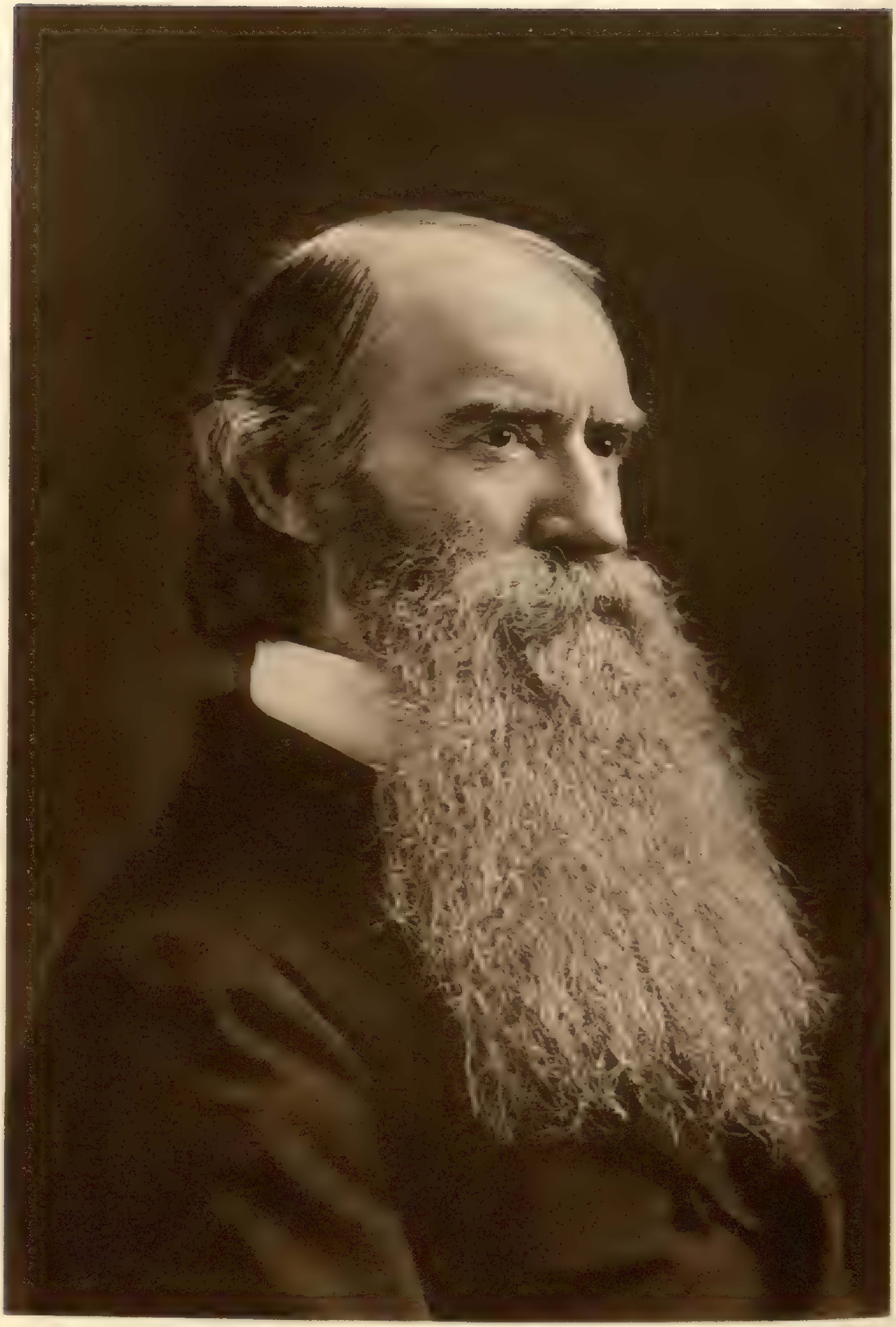

J. S. Newberry

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OF THE

TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., March 15, 1893. No. 3.

John Strong Newberry.

By N. L. Britton.

(With Portrait and Plate CXLII.)

Professor John Strong Newberry, president of this club for ten years, and one of the most eminent scientific men of our time, died at his residence in New Haven, Conn., during the night of December 7, 1892. He was stricken with paralysis on the 3d of December, 1890, and while he recovered from the attack so as to be able to return to his studies for a short time during 1891, his recuperation was at no time sufficient to allow him to exert himself for more than a few hours at a time. Only those who were closely associated with him can realize what a profound loss it was to the Club and to American science generally when he was taken ill, and his death leaves a void which we are sure can never be filled.

Professor Newberry was born at Windsor, Conn., on December 22, 1822. He was thus within about two weeks of being seventy years of age. His family moved to Ohio during his boyhood, and his father became interested in coal-mining, then a new industry in that part of the country. Dr. Newberry's first tendency towards Natural Science was brought about by his observation of the fossil plants of the roofing-shales of these coal mines. He made a large collection of these, and they formed the nucleus of the grand museum of Geology and Palæontology which he built up in later years for the School of Mines of Columbia College. Some of these specimens are still there preserved. He also was early interested in mollusca and collected the land and fresh water shells industriously. I have been repeatedly surprised at his familiarity with shells, but it is true that there was scarcely any group of natural objects with which he was not conversant. He was, indeed, one of the "all-round" men of science, which the modern necessity for specialization has now made almost an impossibility.

His academic education was obtained at the Western Reserve College, from which he was graduated in 1846. He then undertook the study of medicine at the Cleveland Medical College, and received the degree of M. D. from that institution in 1848. The next two years of his life were spent in study abroad, especially in Paris, and in 1851 he returned to Cleveland and took up the practice of medicine, which he continued for about four years. During this period he was continually increasing his knowledge of geology, zoölogy and botany, and his fondness for these sciences was so great that when, in 1855, the opportunity was afforded him of joining one of the government expeditions then engaged in trans-continental surveys for the determination of the most available route for a Pacific Railroad, he gladly accepted the position of geologist and botanist to Lieut. Williamson's expedition to the Columbia River. The party sailed from New York on May 5, 1855, arrived at San Francisco May 30, and on July 9 were camped at Benicia ready to begin active operations, which commenced the following day. The route lay through Suisun, Marysville, up the valley of the Sacramento River to Fort Reading, thence to the Lower Klamath Lake on the northern boundary of California, the Upper Klamath Lake in Southern Oregon, through the Cascade Mountains during September, reaching the Columbia River, opposite the place where the city of Portland now stands, on October 9. Repeated trips of a few days each off the line of the main route were made, and large collections illustrating the natural history of the region were collected, accounts of all of which were published by Dr. Newberry in Lieut. Williamson's Report (Vol. vi. Rep. Expl. and Surv. from Miss. River to Pac. Ocean, 1857), the preparation of these accounts occupying his time for more than a year, during which he was located at Washington. Many of the plants collected came into the possession of Dr. Torrey, and are in the Columbia College Herbarium. Dr. Newberry's chapter on the forest trees of Northern California and Oregon has become a classic in the literature of North American forestry.

Shortly after the completion of his work on this expedition he was attached to the party of Lieut. Jos. C. Ives which explored the Colorado River in 1857–1858, as physician and naturalist. The party assembled in San Francisco in the month of October, 1857, and sailed from that port November 1st, on a schooner for the mouth of the Colorado River. They passed Cape St. Lucas the seventh day out, but the progress of the vessel up the Gulf of California was so retarded by head winds that the point of destination was not reached until November 28. The vessel was unloaded during the next five days, and a start made up the river in a small steamboat which had been brought along. Fort Yuma, at the mouth of the Gila River, was reached on January 5, 1858, Bill William's Fork on February 1, the "Needles" near the mouth of the Mohave Cañon on February 7, that of the Black Cañon on March 8, and the Big Cañon early in April. They then left the river, ascended the Colorado Plateau and proceeded eastward past the San Francisco Mountains, reaching Fort Defiance on May 22, thence to Santa Fé and Fort Leavenworth, and then to the Atlantic Coast.

Dr. Newberry accumulated extensive collections on this expedition. He wrote the Geological Report. The plants were worked up by Drs. Gray, Torrey and Engelmann, and the Zoölogical Report was elaborated by Professor Baird.

In 1857 he was appointed Professor of Chemistry in the Columbian University, Washington, D. C., a position which he held, however, for a short time only.

In 1859 he was attached to the party of Capt. J. N. Macomb which traversed the region from Santa Fé to the junction of the Grand and Green Rivers of the Colorado of the West. The expedition set out from Santa Fé about the middle of July, and proceeded northwestwardly up the Rio Chama and across the divide to the headwaters of the San Juan River into southwestern Colorado and Utah, and back by another route to Santa Fé in the autumn. Dr. Newberry wrote the geological part of the report, which was, however, not published until 1876. It includes descriptions and figures of a large number of Triassic plants.

He became a member of the United States Sanitary Commission in June, 1861, and in September resigned from the army and accepted the Secretaryship of the Western Division of the Commission, with headquarters at Louisville, Ky. He held this very responsible position for five years, and during that time accomplished little work in Natural Science, beyond increasing his geological collections, which had now become very extensive.

On the establishment of the Chair of Geology and Palæontology, in the newly-founded School of Mines of Columbia College, in 1866, Dr. Newberry was elected Professor, a post which he held until his death. His private collection was purchased by the College, and liberal appropriations made for increasing it. These, together with the materials which he was continually collecting himself or receiving as donations or exchanges from other naturalists, have made the Geological Museum of Columbia second in importance to no other college museum in America. His long-continued, diligent and successful researches into fossil plants and fishes make this Museum especially strong in these two groups, it containing a very large number of type specimens, many of which are unique It is gratifying that these lines of investigation are to be followed up at Columbia by two of his students.

The Geological Professorship in the School of Mines necessitated the giving of especial prominence to instruction in Economic Geology, and the strengthening of the collections along that line. Much of Dr. Newberry's time was consequently occupied in this work, and his opinion on ore deposits, quarries and useful minerals generally, was highly prized. Calls to examine mining properties were far more numerous than he could answer, but during every vacation he traveled in one direction or another, so that every mining or quarrying district in North America became known to him. His beloved museum profited constantly during these years, both on the economic and the purely scientific side. He never regarded the economic interests as the primary object of his work, however, and a new genus of fossil plants or fishes was of far more interest to him than a new mine.

In 1869 Dr. Newberry accepted the Directorship of the Geological Survey of Ohio, and enthusiastically devoting all his leisure time to the work, aided by a corps of competent assistants, brought together an enormous amount of information concerning the geology, palæontology, botany and zoölogy of the State which has been published in a series of thick octavo volumes. He also did considerable palæontological work for the Geological Survey of Illinois.

He was one of the judges of Building and Ornamental Stones at the Centennial Exhibition at Philadelphia, in 1876, and wrote the report thereon (Group I. pp. 107–171).

In 1884 he was appointed one of the palæontologists of the United States Geological Survey with especial reference to his favorite studies on fossil fishes and fossil plants. Two quarto fully illustrated monographs on fossil fishes, published in 1888 and 1889, and two yet unpublished monographs on fossil plants, resulted from this appointment.

In 1867 Dr. Newberry received the degree of LL. D. from his Alma Mater. He was an original member of the National Academy of Sciences; an original member of the American Association for the Advancement of Science, and its President in 1867–68; President of the New York Academy of Sciences from 1868 to 1892; President of the Torrey Botanical Club, 1880 to 1890; and a foreign member of the Geological Society of London, from which he received the Murchison Gold Medal for distinguished services to geological science, in 1888.

Dr. Newberry married Miss Sarah B. Gaylord in Cleveland, Ohio, in 1848, who, with six of their seven children, five sons and one daughter, survive him. His eldest son died some years ago.

In Botany the name of Newberry is commemorated in the genus *Newberrya*, Torr. Ann. Lyc. N. Y. viii. 55 (1864), of the Monotropeæ, which must, however, give way to the previously published *Hemitomes*, A. Gray, Bot. Williamson's Exp. 80, Pl. XII. (1857). I have had the plate of this plant *Hemitomes congesta*, A. Gray, *Newberrya congesta*, Torr., reproduced from the original, slightly reduced, and copies of it accompany this notice (Plate CXLII.) *N. spicata*, A. Gray, is another described species. Both are from the Pacific coast.

The following species have been named in his honor:

Physaria Newberryi, A. Gray, Rep. Bot. Ives' Exp. 6 (1861). = *Coulterina Newberryi*, Kuntze, Rev. Gen. Pl. 931 (1891). [Cruciferæ; living.]

Celastrophyllum Newberryanum Hollick, Amboy Clays, N. J., 153 Pl. XLVIII, figs. 1–27 (Ined). [Celastrineæ; Cretaceous.]

Astragalus Newberryi, A. Gray, Proc. Amer. Acad. xii. 55 (1876). [Leguminosæ; living.]

Potentilla Newberryi, A. Gray, Proc. Amer. Acad. vi. 532 (1865) *Ivesia gracilis*, T. & G.; Newb. in Bot. Williamson's Exp. 72, Pl. XI. (1857). [Rosaceæ; living.]

Peucedanum Newberryi, S. Wats. Amer. Nat. vii. 301 (1873) = *Ferula Newberryi*, S. Wats. Proc. Amer. Acad. xi. 145 (1876) = *Coloptera Newberryi*, Coult. & Rose, Rev. N. A. Umbel. 49. [Umbelliferæ; living.]

Viburnum Newberrianum, Ward, 6th Ann. Rep. Director U. S. Geol. Surv. 557 (name only), Pl. LXIV, figs. 10–12; Pl. LXV, figs. 1–3 (1885). Also described and figured in Bull. U. S. Geol. Surv. No. 37, "Types of the Laramie Flora," 113, 114, Pl. LVI, figs. 1–6 (1887). [Caprifoliaceæ; Laramie.]

Leptosyne Newberryi, A. Gray, Proc. Amer. Acad. vii. 358 (1868). = *Leptosyne Douglasii*, D. C. Prodr. v. 531 (1836). [Compositæ; living.]

Leucampyx Newberryi, A. Gray in Porter & Coulter, Fl. Colo. 77 (1876). [Compositæ; living.]

Gentiana Newberryi, A. Gray, Proc. Amer. Acad. xi. 84 (1876). [Gentianeæ; living.]

Pentstemon Newberryi, A. Gray, Bot. Williamson's Exp. 82, Pl. XIV. (1857) = *P. Menziesii*, var. *Newberryi*, A. Gray, Syn. Fl. N. A. ii. Part I. 259 (1878). [Scrophularineæ; living.]

Platanus Newberryana, Heer, in Capallini and Heer, Phyl. Cret. Nebrask. 16, Pl. I, f. 4 (1866). [Platanaceæ; Cretaceous.]

Agave Newberryi, Engelm. Trans. Acad. Sci. St. Louis, iii. 309 (1875). [Amaryllideæ; living.]

Cordaites Newberryi (Daws.), Knowlton, Proc. U. S. National Museum, xii. 607 (1890) = *Dadoxlyon Newberryi*, Dawson, Fos. Pl. Dev. & Sil. Canada, 14, Pl. I, figs. 7–9. [Gymnospermæ; Devonian.]

Cardiocarpon Newberryi, Andrews, Geol. Surv. of Ohio, ii. Pt. II, 425, Pl. XLVI, fig. 2 (1875). [Pteridophyta; Carboniferous.]

Notholæna Newberryi, D. C. Eaton, Bull. Torr. Bot. Club, iv. 12 (1873). [Filices; living.]

Goniopteris Newberriana, White and Fontaine, Rep. PP., Second Geol. Surv. Penna. 84, Pl. XXX, f. 2 (1880). [Filices; Carboniferous.]

Tæniopteris Newberriana, White and Fontaine, Rep. PP., Second Geol. Surv. Penna. 91, Pl. XXXIV, figs. 1–8 (1880). [Filices; Carboniferous.]

Odontopteris Newberryi, Lesq., Coal Flora of Penna., p. 127. [Filices; Carboniferous.]

Pseudopecopteris Newberryi, Lesq., Coal Flora of Penna., 202, Pl. XXXVII, fig. 1. [Filices; Carboniferous.]

Pecopteris Newberryi, Lesq., Geol. Surv. of Illinois, ii. 443 (1866) = *Sphenopteris Newberryi*, Lesq., Bobst. Journ. Nat. Hist. vi. 420 (1854) = *Diplothmena Newberryi*, Stur. Abh. K. K. Geol. Reichsanst, vii. 124 (1877). [Filices; Carboniferous.]

Archæophyton Newberryanum, Britton, Ann. N. Y. Acad. Sci. iv. 124 Pl. VII. (1888). [Alga; (?) Archæan].

Dictyophyton Newberryi, Hall. Sixteenth Annual Report of the Regents of the University of the State of New York, p. 87, Pl. IV., figs. 1–3, (1863). [Algæ; Silurian].

Fragilaria Newberryi, Ehrenb., Abh. K. K. Akad. Berlin, 1870, p. 56, Pl. III., fig. 12. [Diatomaceæ].

Archæophyton Newberrianum, Britton, Ann. N. Y. Acad. Sci. iv. 124, Pl. VII. (1888). [Alga; (?) Archæan.]

The following list of titles of his botanical writings is abstracted from a complete bibliography, prepared in the main by himself, recently revised by Prof. Jas. F. Kemp and Mr. Arthur Hollick, and published in the School of Mines Quarterly.

This bibliography includes 197 titles.

LIST OF BOTANICAL PUBLICATIONS OF PROFESSOR J. S. NEWBERRY.

"On the Structure and Affinities of Certain Fossil Plants of the Carboniferous Age."—Proc. Amer. Asso. 1853, 157; Annals of Science, i. 268.

"On the Carboniferous Flora of Ohio."—Proc. Amer. Asso. 1853, 163; Annals of Science, i. 280.

"Catalogue of the Fossil Plants of Ohio."—Annals of Science 1853, i. 95–106.

"New Fossil Plants from Ohio."—Annals of Science 1853, 116–128 and 153.

"The Botany of Northern California and Oregon."—United States Pacific Railroad Report, vi. Botanical Report, 1–94, sixteen plates (1857).

"Catalogue of Plants of Ohio."—Ohio Agric. Report and Reprint, pp. 41 (1859).

"Cretaceous and Tertiary Plants."—Hayden's Report on Exploration of Missouri and Yellowstone Rivers, 146 (1859–60).

"The Ancient Vegetation of North America."—Amer. Jour. Sci. xxix. 208 (1860).

"The American Cretaceous Flora."—Amer. Jour. Science, xxx. 273 (1860).

"Description of Fossil Plants Collected by the N. W. Boundary Commission."—Proc. Bost. Nat. Hist. Soc. vii. and Reprint, pp. 19 (1863).

"Report on the Fossil Plants Collected in China by Mr. Raphael Pumpelly."—Smithsonian Contributions, 1868, p. 119, Pl. I.

"Notes on the Later Extinct Floras of North America."—Annals Lyc. Nat. Hist. ix. 1, 1870, Reprint, 8vo. p. 76.

"Notice of Fossil Plants from the Cretaceous Sandstone of Fort Harker, Kansas, and from the Miocene of Bridge Creek, Oregon."—Proc. N. Y. Lyc. Nat. Hist. i. 148 (1870).

"Notice of Angiospermous Leaf-Impression in a Red Sandstone Boulder Found in Excavating the Foundations of a Gas Office in Williamsburg, L. I."—Proc. N. Y. Lyc. Nat. Hist. i. 149–150 (1871).

"Geological Survey of Ohio."—Vol. i. Part II. (1873), Description of Fossil Plants, pp. 355–385, eight plates.

"On the Results of the Removal of Forests."—Proc. N. Y. Lyc. Nat. Hist. Second Series, 31 (1873).

"On the So-called Land Plants of the Lower Silurian of Ohio."—Amer. Jour. Sci. II. viii. 110–160 (1874).

"Devices Employed in Nature for the Distribution of the Seeds of Plants."—Scientific American, May, 1879.

"Geological History of the North American Flora."—Bull. Torr. Bot. Club, vii. 74 (1880).

"On Cell Functions in Organic Structures."—Trans. N. Y. Acad. Sci. i. 42 (1881–2).

"Description of Fossil Plants from Western North America."—Proc. U. S. Nat. Museum, 1882, 502.

"Botany and Geology of the Country Bordering the Rio Grande."—Trans. N. Y. Acad. Sci. vii. 90 (1883).

"Notes on Fossil Plants from Northern China."—Amer. Jour. Sci. xxvi. 123 (1883).

"Notes on the Geology and Botany of the Country Bordering the Northern Pacific Railroad."—Annals N. Y. Acad. Sci. iii. (1884).

"Description of *Spiraxis*, a Peculiar Screw-like Fossil from the Chemung Rocks."—Annals N. Y. Acad. Sci. iii. (June, 1885).

"Saporta's Problematical Organisms of the Ancient Seas."—Review. Science (June 19, 1885).

"*Pinus monophylla*, Torrey and Fremont, a Variety of *P. edulis*."—Bull. Torr. Bot. Club, xii. 50 (1885).

"Flora of the Amboy Clays."—Bull. Torr. Bot. Club, xiii. 33 (1886).

"A New Species of *Bauhinia* from the Amboy Clays."—Bull. Torr. Bot. Club, xiii. 77, pl. 1 (1886).

"The Cretaceous Flora of North America."—Trans. N. Y. Acad. Sci. v. (February, 1886).

"*Pinus monophylla*, a Variety of *P. edulis*."—Second paper, Bull. Torr. Bot. Club, xiii. (October, 1886).

"The Ancestors of the Tulip Tree."—Bull. Torr. Bot. Club, xiv. (January, 1887).

"Food and Fibre Plants of the North American Indians."—Pop. Sci. Monthly, xxxii. 31 (1887).

"Fauna and Flora of the Trias of New Jersey and the Connecticut Valley."—Trans. N. Y. Acad. Sci. vi. 124 (1887).

"Fossil Fishes and Fossil Plants of the Triassic Rocks of New Jersey and the Connecticut Valley."—Monograph xiv. U. S. Geol. Surv. (1888).

"Triassic Plants from Honduras."—Trans. N. Y. Acad. Sci. vii. 113 (1888).

"Rhætic Plants from Honduras."—Amer. Jour. Sci. xxxvi. 342 (1888).

"The Laramie Group. Its Geological Relations, its Economic Importance and its Fauna and Flora."—Trans. N. Y. Acad. Sci. ix. 6 (1889).

"The Flora of the Great Falls Coal Field, Montana."—Amer. Jour. Sci. (III.) xli. 191–201, Pl. XIV. (1891).

The portrait accompanying this notice is reproduced from a photograph taken about 1886 and first published in Prof. H. F. Fairchild's "History of the New York Academy of Sciences." It is here used by permission.

Death of Isaac C. Martindale.

The readers of the Bulletin will receive with deep sorrow the news of the sudden death of Isaac C. Martindale from apoplexy, at his home, No. 322 Penn street, Camden, N. J.

Mr. Martindale was born in Byberry, Philadelphia county, Pa., July 15, 1842. His parents were members of the Society of Friends, and his early education was acquired chiefly in schools under their control. His father was a descendant of John Martindell, who early settled in Bucks county, Pa. Many of the family have become prominent in the history of that region. His ancestry on both sides had shown literary ability which he inherited, while there was also in him an inherent love for nature. He began the study of natural history while on his father's farm, and in spite of of lack of books he acquired considerable scientific knowledge in all its departments. He left the farm to become a clerk in a bank at Byberry. In 1875 he was appointed Cashier of the National State Bank of Camden, the duties of which he performed with great fidelity. A few years ago some of his friends established the Camden National Bank, the cashiership of which was confided to him. He had been for the last three years Treasurer of the Academy of Natural Sciences in Philadelphia, a position in which his financial ability made him eminently useful.

The study of botany, in whatever hours he could snatch from his daily duties, was to him a welcome relaxation. He early made himself acquainted with the plants in the vicinity of Byberry. A short tour in Europe in which his eyes were delighted by the mountain Flora of Switzerland, and during which he made considerable collections, enabled him to lay a foundation for that extensive Herbarium which was to be his chief life-work. After his removal to Camden, his close proximity to the rich and peculiar Flora of the "Jersey Pines" opened to him a new and most fascinating field, in the study of which he profited by the companionship and accurate local knowledge of the lamented Charles F. Parker. From that time onward, with most assiduous effort, most untiring industry, and with large pecuniary outlay, he devoted himself to the increase and perfection of an Herbarium which has few, if any rivals among the private collections in the land.

He published in November, 1879, in the American Naturalist, a list of plants collected on an excursion of some members of the American Association for the Advancement of Science to the vicinity of Pike's Peak in 1878, with critical notes on various species. In 1880 he read before the West New Jersey Surveyors' Association a paper entitled "Notes Upon the Bartram Oak" (*Quercus heterophylla*), with a summary of the literature concerning that mooted form. He published in the proceedings of the Philadelphia Academy for 1880, a short paper on "Sexual Variations in *Castanea Americana*." He also prepared a most valuable "list of the marine algæ hitherto observed on the coasts of New Jersey and Staten Island," which was published in the first volume of the Memoirs of the Torrey Club. For the proceedings of the Philadelphia Academy for November, 1883, he furnished a very just and feeling biographical sketch of his friend Charles F. Parker, who had died the previous September.

Although botany may be said to have been Mr. Martindale's chief love among the sciences, and that to which he had mainly devoted himself, it was by no means his exclusive hobby. Entomology received a large share of his attention, and as early as 1863 he was elected a corresponding member of the American Entomological Society. During his last years he devoted himself largely to the study of Lepidoptera, and had made a collection which experts in that department have pronounced as very nearly the finest in America. He was much interested in meteorology, and was for a time one of the observers for the Smithsonian Institute, and had given much labor to the investigation of the history of his nativet own (Byberry), and to the study of his family genealogy.

It is remarkable that a man burdened with such exacting and responsible business cares, should have been able to accomplish so much in what were to him mere avocations, and botanists cannot help recalling the similar instances of Dr. Wm. Darlington and David Townsend, of West Chester, Pa., both bank officers, and both most ardent and successful botanists. And yet it is to be feared that Mr. Martindale overtaxed his strength, and perhaps had he shortened his hours of labor he might have been spared to the world for many years longer. Symptoms of failing health had led him to resign his position, within a week or two before his death, in order that he might find resoration by travel, and he had intended a visit to South America.

J. H. REDFIELD.

Anatomy as a Special Department of Botany.*

BY EMILY L. GREGORY.

The question of the exact limitation and relative importance of the various departments of botany is by no means a simple one. To verify this assertion it is necessary only to consider briefly the definitions given by some of the best writers of botanical text books. In our own country there is perhaps no higher authority than that of Asa Gray, who in his text book of 1857 says: Physiology is the study of the way a living being lives and grows and performs its various operations. The study of plants in this view is the province of Vegetable Physiology. The study of the form and structure of the organs or parts of the vegetable by which its operations are performed, is the province of Structural Botany. The two together constitute Physiological Botany," &c. The title page of the same book is headed "Gray's Lessons in Botany and Vegetable Physiology," and again in the text we find "Botany is the name of the science of the vegetable kingdom in general."

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* Read before the American Association for the Advancement of Science, Rochester Meeting, 1892.

" The study of plants as to their kinds is the province of Systematic Botany, and finally, " Other departments come to view when, we consider plants in their relations to other things, as Geographical, Agricultural, Medical, Botany and the like."

By these definitions, vegetable physiology is not identical with physiological botany, for the latter is made to include vegetable physiology and structural botany, and the name of the book, " Lessons in Botany and Vegetable Physiology," implies that botany, does not include vegetable physiology. Again systematic botany is here made a distinct, separate department of equal rank with physiology and structural botany. However, if we examine closely into the practical outcome of these definitions, we shall find that except the inaccuracy of excluding vegetable physiology from the subject *botany*, they correspond with the manner of growth and development of these different departments in this country.

If Structual Botany is understood to include two parts, namely: the doctrine of external form and that of internal structure, it is easy to see in what sense Gray included structual in the province of Physiological Botany. The doctrine if the internal structure of plants, or Anatomy, is so closely connected with that of physiology, that to teach the elements of either successfully, both must be combined. It is probably not too much to say that in comparison with the progress made in the science of vegetable life in other countries, we are as yet not much beyond the elementary stage. Certainly we were not at the time Gray wrote the above definitions. At that date systematic botany occupied by far the most important place, and was therefore rightfuily ranked of equal if not of greater importance than the other branches. Also it was according to the normal method of developing a science to group together subjects less thoroughly understood and less studied under a general term whose exact meaning was not sharply defined, This term was physiology, or, as Gray puts it, physiological betany. There were then practically two divisions of the science, systematic and physiological botany, a more or less thorough knowledge of the former being necessary to a successful study of the lattar. This, though perhaps never before stated in so many words, was about the actual status of the subject at that date. This book was revised in 1868 with no change in the definitions (?) In 1887 the "Lessons in Botany" were printed in which the definitions of the various branches of the subject correspond much more nearly to the present condition of the science. Even here there is a striking lack of definiteness and precision as compared with the definitions of the other later authors. For example, he says: "The study of the actions of plants, or of their parts, of the ways in which a plant lives, grows, and acts, is the province of physiological botany or vegetable physiology." Notice here the use of the two terms as identical. Pfeffer defines plant physiology as follows: "Physiology has the task, to find out exactly, according to measure and number, the processes which take place in an organism, to trace back these processes to their origin, and to learn their signification in the economy of the organism." The most restricted text book definition of the word physiology is probably that of Wiesner's, who says: "The province of physiology, using the term in its restricted sense, is to trace back all the phenomena of life to mechanical processes." Nothing could be more true and at the same time comprehensible than this. The only objection to it is, it is too restricted to cover what even Wiesner himself includes in his text book under the head of physiology in its restricted sense.

With the exception of this peculiar view of the province of physiology, Wiesner's definitions of the branches of the science very fairly represent the present accepted use of terms and manner of treatment. His exposition of the subject is briefly as follows: There are two branches which include the entire field of scientific botany, morphology and physiology. The first concerns itself entirely with the form relations of plants and their ports, the second with the conditions and phenomena of the life of the plant. Morphology is subdivided in four branches. 1. Descriptive morphology, or description of the outer form of organs; 2. The inner structure, or anatomy; 3. Development history, or tracing the development of plant, or organ; 4. Systematic morphology, or tracing the organs back to a few types.

Physiology is subdivided in two brances: 1. Physiology in its restricted sense as defined above; 2. Biology, or the consideration of vital processes, which cannot, at our present stage of knowledge be traced to any mechanical causes.

It is hoped a brief consideration of these views will bring us to our subject, anatomy as a special department of botany. In regard to the province of physiology the restriction made by Wiesner is by no means accepted by the majority of botanists. His use of the term biology is, I believe, peculiar to himself, as nearly all other German botanists and text book writers use it as including that part of botany which treats of certain phases in the life of plants which show most clearly the difference between lifeless and living matter; these are processes concerned in reproduction, in prolonging the life of the individual or species, and in short in the origin and end of living organisms. Accordlng to the present teaching, Pfeffer's definition of physiology covers the meaning, and to this may be added, that it is generally subdivided into physiology of nutrition and that of growth.

Taking up now the morphological side, it may be shown that Weisner's four branches may easily be reduced to two; Anatomy, which stands in close relation to Physiology; Systematic Morphology, holding the same relation to Systematic Botany. In this way the latter includes the three branches, descriptive morphology, development history, and the tracing organs back to a few types, which Weisner names Systematic Morphology, but which may be just as appropriately named Metamorphosis, leaving the term Systematic Morphology to represent the three combined.

Of these three, the first is too well known to require proof of its connection with Systematic Botany. The second has received very little attention frsm our botanists, and it may be of interest to explain briefly in what way it contributes to our knowledge of plant classification. Again quoting from Weisner, Development History is of service to Systematic Botany in two ways: First, by the examination of similar organs throughout all their phases of growth, their similarity is much more clearly shown than by simply studying them when fully grown, for example, leaves; dissimilar ones, on the other hand, appear more distinctly and sharply separate, as stem and root. Secondly, by the study of organs in all their phases of growth, the leaves, by which they develop, are made clear, and their probable relationships more easily determined than by the study of fully-developed organs and plants. The third branch, Metamorphosis, is plainly connected with classification, it is also equally evident that it does not represent a department of the science of the same grade as that of Anatomy.

Summing up these conclusions we practically return to the same position which Gray assumed so long ago. As a science, botany may be divided in two branches, morphology and physiology. Practically it is divided into systematic botany and physiology, or into two branches of such a character that one is and must be represented by systematic, the other by experimental and theoretical work. To illustrate more fully what is meant by this, as well as to substantiate the statement, one example may be given, the botanical work in the University of Berlin. It is well known that there are two departments about equal in rank, physiology and systematic botany. In the department of physiology, of which Prof. Scwendener is at the head, general botany is taught, that is, the different branches as above described as included under the head of scientific botany; the principal work, however, of this department is physiological and that of the highest order. In the other school, of which Prof. Engler has charge, systematic work forms the main line of study, and this is known as *special* botany. There is no other provision for special branches, except that which falls naturally into one or the other of these two provinces. Thus while the instruction given in both cases necessarily is not limited by close lines of definition, the work really shapes itself in two directions, and these two lines are those which represent at the present day, the natural divisions of the subject. As to their relative importance there is not the slightest room for discussion, as no physiologist can succeed without a fair knowledge of systematic botany, while the reverse is equally true.

These somewhat prolix statements of more or less familiar facts were thought necessary in order to define exactly the position which plant anatomy holds to the remaining branches, and its consequent relative importance. It holds a similar relation to physiology that morphological botany does to classification. It is no more possible to succeed in the investigation of questions now interesting the scientific world in the province of plant physiology, without a thorough knowledge of the minutest details of internal structure, than it is to take up questions of similar importance in the field of plant classification without a practical knowledge of that part of morphology on which classification mainly depends.

At the time Gray wrote his definitions as above quoted, this branch of the science was in its infancy; twenty years after this date, De Bary finished his text book on "The Comparative Anatomy of Phanerogams and Higher Cryptogams," which is now the standard authority on anatomical questions. Fifteen years have passed since De Bary's book was published, and during this time much progress has been made in this branch. Such progress in any department renders necessary a corresponding growth in text books and in methods of treatment. Whatever may be true of text books in general, it is believed safe to say that the English written text books of the day are singularly deficient in this respect. Abstruse and difficult physiological problems are introduced to students illy-prepared to handle them, while they try to meet the deficiency by a partial description of anatomical characteristics, a knowledge of which is necessary even to a comprehension of the questions. Not only must the standard of text books be raised, but the methods of instruction must be improved if we expect to cope successfully with some of the most interesting problems of the day.

For example, such subjects as twining stems, transmission of stimulus, nutation, and other intricate questions are often given to the students who have completed an elementary course in what we term type work, or sometimes, general botany, which includes a bird's-eye view of the various classes of plants with only the merest elements of anatomical training. Expensive pieces of apparatus are exhibited and their manner of working explained to students whose training is wholly inadequate to enable them to make an intelligent use of such apparatus.

Assuming the truth of our statements it is comparatively easy to find an explanation for this condition. Very few of our institutions of learning recognize the "Science of the Vegetable Kingdom" as a separate independent subject, and still fewer have any conception of its real nature, of its position in other countries, and of its importance in reference both to the practical and theoretical questions of the day. It is, however, not so easy in a limited space to show clearly in what manner anatomy is so closely connected with physiology, and in this way to verify the statements made. One or two illustrations may be taken from the prominent discussions now occupying plant physiologists.

Anatomy may be divided into, or it consists of two parts, that of the cell, and that of tissues. In the study of the cell, for convenience, it is treated as wall and contents. With the contents as the seat of life, or Lebens-träger, are connected most of the questions concerning nutrition or the changes undergone in substance used as food. With the wall, as well as with certain parts of the contents, are connected questions of organized structure among which are some of the most absorbing interest and in whose solution some of the keenest thinkers of the time are employed.

Wiesner has recently published a book entitled "The Elementary Structure and Growth of Living Substance," in which he proposes a theory in several respects directly opposed to the accepted one which is known as the micellar theory of Naegeli. For example, according to the latter theory, the units of structure or micellae of organized matter are held together by the law of attraction and the cause of enlargement of such structures on taking in water is due to the penetration of water between the micellae of the substance composing the structure. According to Wiesner the units of structure are held together by fine protoplasmic strings, and as water is drawn away, by evaporation, the interstices between the units are filled with air; if water be added it is taken into the units themselves, which become enlarged proportionately; the change in volume caused by change in water contents depends, therefore, on change in the diameter of the units, and not on the lengthening or shortening of the protoplasmic strings.

Physiology treats of how a living organism grows and performs its various actions; this question, therefore, lies at the very foundation of physiology, as on it depends largely the manner of growth and other forms of motion. This will be seen by considering such subjects as the law of leaf position. Were Wiesner's theory the correct one, Schwendener's law, which is based upon Naegeli's theory would fall to the ground, and another reason must be sought in consonance with the facts. The position and authority of Wiesner is too well known to require mention here, and it is probably equally well known how strong are the arguments against most of the peculiar views which he advocates.

Other illustrations may be given to show the connection between a knowledge of the anatomy of tissues and that of their physiology. If a leaflet of the sensitive plant be touched in a certain way, it closes, and one after another all the remaining leaflets follow its example in regular order of succession. How is the effect communicated from the first leaf to the second and so on? This question has already occupied much time and energy in its attempted solution, but how can one hope to be able to add anything to that already known about it, without a thorough knowledge of the anatomy of the tissues through which the stimulus passes! Another more hackneyed subject, but even better than this as an illustration, is the so-called water question. If any one doubts the necessity of training in anatomy as requisite to physiological study, let him attempt to explain the present theory of the ascent of water through the trunks of high trees, to a person ignorant of plant anatomy.

In one of the editions of Gray's structural botany in speaking of the various departments of the science, he says: "A complete system of classification can only be made when our knowledge of all the other departments becomes complete." If this is the end toward which we are all striving, the importance of a proportionate and symmetrical development of the various branches can hardly be over-estimated.

Notes on Some Algæ in the Herbarium of the Long Island Historical Society.

By W. G. FARLOW.

Recently I received from Dr. Jelliffe some specimens of marine algæ from the collections of Mr. J. Hooper, Mr. Calverly and Col. Pike, now in the Herbarium of the Long Island Natural History Society, and since several of the species are scarcely to be found in other herbaria, the following notes may be of interest.

Of *Callithamnion Dietziæ*, Hooper, three specimens, were sent. That numbered 109 is the type specimen, and out of it was cut a piece which is now the only specimen of the species in the Harvey Collection in Trinity College, Dublin. Another specimen without number marked merely *Call. Dietziæ*, Hooper, appears to be the same thing, although much faded and not in especially good condition. No. 108, however, called also *Dietziæ*, does not seem to me to belong to that species but to be rather *C. byssoideum*. The fourth specimen is marked "cum fructu." It is in reality sterile, and what was probably mistaken for fruit is nothing but the more densely colored chromatophor which is collected at the nodes. This specimen hardly can be referred to *Dietziæ*, although it is too young and undeveloped to enable one to say exactly to what species it belongs. The two specimens from Herb. Hooper and that in Herb. Harvey appear to be the only authentic originals in existence, and none of them have cystocarpic fruit. I have recently been able to examine again the specimen in Herb. Harvey, and although in my Marine Algæ of New England, p. 127, it did not seem to me that I was warranted in trusting to my memory in expressing a decided opinion on a specimen which I had not seen for several years, a recent reëxamination only confirms the opinion which I originally formed, viz: that *C. Dietziæ* is in reality a very slender form of *C. Baileyi*, Harvey, rather than a distinct species related to *C. corymbosum* and *C. versicolor*, the view adopted by Harvey in the Nereis, ii, 236. I have no doubt that several of my specimens of *C. Baileyi* var. *laxa*, collected at Wood's Holl are identical with the originals of *C. Dietziæ* in Herb. Hooper. The great variability of *C. Baileyi*, well known to all who have collected largely on the New England coast, would hardly be suspected by those who have seen merely herbarium specimens.

Two specimens marked *Fucus canaliculatus*, collected by Col. Pike, at Fort Hamilton and Astoria, were sent by Dr. Jelliffe. The specimens certainly had all the appearance of belonging to this species, although the conceptacles were so young that it was not possible for me to decide whether the structure was that of *Pelvetia*, in which genus the species is now placed by algologists. *P. canaliculatus* is a very common species of Europe, but has not yet been found with certainty in the United States. Whether it is possible that there is an error in localities as given by Col. Pike could, probably, be easily settled by Brooklyn algologists, for the species should be easily recognized at Fort Hamilton by collectors at the present time.

Ectocarpus Dietziæ, Harvey, and *E. Hooperi*, Harvey. Unfortunately, the originals of these two species in Herb. Hooper and Herb. Harvey are all sterile, and it is practically out of the question that future algologists should ever be able to recognize them again, there being nothing specifically characteristic in the sterile plants. All that one can say is, that of the two specimens of *E. Hooperi* in Herb. Hooper, one, No. 590, agrees with Harvey's figure in the Nereis in having short spinose ramuli, but No. 55 does not agree at all with the figure. Exactly what either of them is cannot be determined from the original specimens, and *E. Hooperi*, as well as *E. Dietziæ*, should be dropped from the list of known *Ectocarpi*. The original specimen of *Ectocarpus lutosus*, Harvey, from Herb. Hooper, shows that the specimens from Wood's Holl, mentioned in the Marine Algæ of New England, were correctly determined.

Codium tomentosum, Stackhouse.—A specimen of this species is labelled Greenport, L. I., but the locality needs confirmation. This alga is common in many parts of the world, and the New England coast is one of the comparatively few places where it is not known to occur. It appears more probable, seeing how commonly specimens of the species are found in collections, that there is an error in the label than that its presence in Long Island Sound should have escaped the observation of the numerous collectors in that region.

The specimens of *Wrangelia filicina*, Harvey, and *Hypnea Wurdemanni*, Harvey, are to be referred respectively to *Wrangelia penicillata* and *Eucheuma isiforme* as stated in the Nereis. The *Striaria attenuata* of Herb. Hooper is not that species, but *Dictyosiphon fœniculaceus*, Greville, and *Mesogloia multifida* from the same source is *Mesogloia divaricata* Kuetzing.

A Study of Solanaceous Anthracnoses.

The tomato, pepper and egg-plant are three vegetable fruits belonging, as is well-known, to the same family (Solanaceæ) of plants. Two anthracnoses are recorded upon the tomato, namely: *Glœosporium fomoides*, Sacc., and *Colletotrichum Lycopersci*, Chest. The pepper has two also, *Glœosporium piperatum*, E. & E., and

Colletotrichum nigrum, E. & Hals. Upon the egg-plant are likewise two, the *Glœosporium Melongenœ*, E. & Hals., and a *Colletotrichum*, sp., found by the writer for the first time the past season in the trial plots of a large seed-grower, and, for reasons developed in this paper, remains unnamed as such.

It will be seen that there is a *Glœosporium* and a *Colletotrichum* upon each of the three Solanaceous plants.

By means of inoculations the *Glœosporium* of the tomato has been made to grow upon the egg-plant, and, what is of more interest, also upon the pear, banana, bean, quince and grape, while there was a mutual exchange effected with the apple; that is, the *Glœosporium fructigenum*, Berk., was successfully transferred to the tomato, as well as the native tomato *Glœosporinm* to the apple when it produced the true ripe-rot.

No attempts were made, from lack of proper virus at the time, to grow the egg-plant *Glœosporium* upon any other fruit. The pepper *Glœosporium*, however, was taken to the banana, pear, grape, persimmon, and a mutual exchange was made with the apple in the *Glœosporium fructigenum*, Berk. We have therefore, the ripe-rot of the apple thriving upon the tomato and the pepper, and it was grown also upon the egg-plant.

By an axiom it would seem to be concluded that the three species of *Glœosporium*, which have no real structural differences, and recorded for the three Solanaceous plants are reducible to one, and that that one is the old and familiar bitter-rot of the apple, namely; *Glœosporium fructigenum*, Berk. Three years ago Miss Southworth, while in the Division of Pathology of the Department of Agriculture, proved in a similar manner that this bitter-rot was identical with an anthracnose of the grape, and because the affected grapes were not bitter, but nearly mature when diseased, the name ripe-rot was proposed. This term is well adapted for the further expansion of the species, and the specific name of *fructigenum* given by Berkeley is almost prophetic.

The accompanying engraving was made from a photograph of one of the inoculations of the pepper ripe-rot germs from the apple. The appearance to the eye of the anthracnosed pepper was quite different from that of the apple, but the condition of flesh texture and character of the skin, etc., were very unlike, which accounted for the more rapid growth in the pepper and the greater shrinking of the diseased area. However the microscopic structures were the same in both and the individual acervuli similar.

Less work was done with the *Colletotrichums* of the three plants under consideration because of lack of virus and of time and opportunity to use it. The *Colletotrichum* of the egg-plant was easily grown upon the pepper. It also thrived upon the bean, producing pod-spots, and in turn the native Pod-spot Fungus (*Colletotrichum Lindemuthianum* S. & M.) was grown upon the egg-plant. This was a direct exchange and carries with it a double weight of proof. The *Colletotrichum* of the bean was grown upon the pear, and the one native to the pear flourished

upon the tomato. This one of the pear and the pod-spot *Colletotrichum* of the bean were at the same time introduced upon different areas of a citron, and the two in growing produced a blending anthracnose blotch made up of a single species of *Colletotrichum.* It is therefore shown that the chain of evidence is strong that all three of the Solanaceous plants are preyed upon by the same *Colletotrichum*, and that it is the one so familiar to truck growers as the pod-spot fungus, namely, *Colletotrichum Lindemuthianum*, S. & M. Whatever differences in appearance upon the various hosts there may be they seem entirely due to the varying conditions which attend the growth of the anthracnose. The microscope is not sufficent to distinguish from which host the fungus has been taken for inspection.

If these cultures give the true relation of the anthracnoses it is evident that the view now held by mycologists may need some modifications to fit the facts. In an economic aspect the information has its value as it shows a close connection between the anthracnoses of the several garden crops. That is, one fruit does not blight to its own kind alone. A decaying tomato or apple is neither its brother's nor its cousin's keeper.

BYRON D. HALSTED.

Two New Species of Mosses from Idaho.

BY J. B. LEIBERG.

(PLATES CXLIII.—CXLIV.)

DITRICHUM MONTANUM n. sp.—Plants cæspitulose, 1–2 cm. in length, fastigiately branching from the base, above more or less dichotomous. Monoicus, seldom synoicus; antheridia terminal on the apex of the basilar branches and of short axillary branchlets, few, without paraphyses; perigonial leaves 3–5, of two sorts, short, serrulate, concave, apiculate, costate, loosely areolate bracts, and longer, broadly costate, canaliculate ones, more compactly areolate, resembling the stem leaves but shorter, the two sorts occurring together, and now the one and now the other enclosing the antheridia.

Stem leaves erect or slightly curved, lanceolate below, channeled and subulate above with a narrow lamina of two to three rows of cells, subserrulate and inflexed margin of two rows of cells, apex coarsely toothed; costa broad, strong, ceasing below the apex, above more or less concave on the upper face, convex on the back, flattened below; a row of parenchyma cells (Deuter) all around on the outside and a more or less continuous one through the centre of the costa, the sclerenchyma cells (Stereïden) very small and confined to the interior of the nerve; areolation above and in the middle of hyaline or chlorophyllose, thick-walled quadrate cells, rectangular below, yellowish at the insertion; outer perichaetial leaves similar to the stem leaves, the inner broadly sheathing. Pedicel pale yellow, 1.5–2.5 cm. long, usually twisted a few times when dry. Capsule 2–3 mm. in length, light orange or brown, red and narrowed at the mouth, erect, elliptical; when dry very much compressed laterally, with a few longitudinal wrinkles. Teeth of peristome cleft to the base into two semiterete equal segments, minutely papillose with a faint median line, rather obscured and distantly articulate, at the falling of the lid intertwisting and breaking away at the articulations, attached to a short, minutely-punctulate, protruding basilar membrane. Annulus double, narrow, dehiscent, of two rows of cells. Lid elongated, conical, reddish, ¼–⅓ the length of the capsule. Calyptra long, subulate, mostly persistent and falling with the lid, light greenish, the expanded portion narrow and about ⅓ the length of the capsule.*

Habitat.—On broken soil, upturned tree-roots, etc., in mountain regions at all elevations up to at least 8,000 feet. Kootenai Co., Idaho, J. B. Leiberg, No. 126, 1889; Suoqualmie Pass, Cascades, C. V. Piper, No. 119, August, 1891.

GRIMMIA PACHYPHYLLA, n. sp. § Rhabdogrimmia. In wide, dense, inflated mats, grayish or yellowish green above, dirty yellow or brown below, repeatedly dichotomous, subsimple plants intermixed, erect or sometimes ascending from a decumbent base, abundantly radiculose to above the primary innovations, robust, 5–12 cm. in height. Leaves closely imbricate when dry, spreading when moist and the upper portion more or less recurved, oblong or broadly lanceolate from an erect open

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[*] Specimens sent by me to J. Breidler, at Vienna, and compared by him with the type of *Ditrichum Knappii* (Jur.) at the Herbarium of the Hof-Museum differ from that type in the clearly-defined, smaller vein, the cells of the upper part of the leaf being larger and more quadrate, the margins incurved. This new species seems to be quite distinct from *D. pallidum*, though like it in its inflorescence and general appearance.
E. G. BRITTON.

base, not clasping, shortly decurrent at the basal angles, carinate above and reflexed on the margins, strongly costate, the nerve pluri-stratose, more or less channeled, above becoming laminoid and gradually narrowing into a long straight or flexuous hair with a few weak salient or appressed teeth; cells of the areolation elongated-rectangular below, broader, subgraduate in the middle, small-graduate above, chlorophyllose, all sinuous and the cell walls very thick and dense and remarkably elastic; the margin of the leaf of two or three rows of nearly graduate cells, and the extreme base and decurrent angles of a few irregular, oblong or subrhombic, ones. Inflorescence dioicous; ♂ plants growing mixed with the ♀ usually somewhat shorter and more branched, occurring but sparingly; antheridial buds in the axils of the innovations, occasionally terminal on very short lateral branchlets, perigonial bracts 3–4, short, acute, thinly costate; cells of the upper half of the bract, narrow, short-rectangular or quadrate, sinuous, chlorophyllose, of the lower half broad-rectangular, straight, hyaline; antheridia large, numerous without paraphyses; archegonial inflorescence from secondary branches, sometimes direct from the axils of the innovations.

Capsule oval or oblong 2–5 mm. long, often two from the same perichætium, pendent on a twisted pedicel, 0.5–1 cm. in length, red and narrowed at the mouth, with a distinct collum, substrumose, at least when fresh and mature, erect when dry and pedicel more strongly twisted, longitudinally wrinkled, the ridges prominent, continuous or interrupted, 4–8 in number; perichætial leaves only sheathing to a little above the vaginule, otherwise similar to the stem leaves; lid red, subulate, $\frac{1}{2}$–$\frac{3}{5}$ of the length of the capsule. Calyptra 4–5 lobed covering the lid only.

Teeth of peristome cleft to below the middle into two segments, sometimes merely lacunose along the median line, thin, minutely papillose above the middle when fresh, articulations few, incurved when dry. Annulus simple, of two rows of thin cells, narrow, strongly persistent, detaching in fragments.

Habitat granite, gneissoid and slate rocks throughout Kootenai Co., Idaho. J. B. Leiberg, No. 250, 1890–92. Characterized from living specimens.

A fine form of the Rhabdogrimmia section, most nearly related to *Grimmia decipiens* (Schultz), Lind., from which species it differs mainly in its dioicous inflorescence, its open leaf base, smoother hairy point, its broader basilar, its shorter medial, and its quadrate-apical areolation, its pluri-stratose nerve, the longer beak of its lid, its narrow and persistent annulus, and the peristome incurved when dry.

EXPLANATION OF FIGURES.

(PLATE CXLIII.)

DITRICHUM MONTANUM, LEIBERG.

Fig. 1. Plant natural size.

Fig. 2. Capsule with lid and portion of pedicel.

Fig. 3. Calyptra.

Fig. 4. a. Cross-section of capsule at maturity; 4 b. same when old and dry.

Fig. 5. a. Peristome; 5. b. basilar membrane; 5. c. reticulation of capsule at mouth; 5. d. same near base.

Fig. 6. One of the sheathing perichætial leaves.

Fig. 7. Apex of leaf with margin rolled back; 7. a. fragment of upper one-third of leaf; 7. b. fragment of central portion of leaf; 7. c. same at base.

Fig. 8. Outline of a stem leaf.

Fig. 9. Two perigonial leaves with antheridia.

Fig. 10. a., 10. b. and 10. c. sections of the costa and portions of the lamina of a stem leaf.

Fig. 11. Fragment of leaf from near apex to show double row of marginal cells.

Fig. 12. Male bud.

All the figures, except No. 1, highly magnified.

(PLATE CXLIV.)

GRIMMIA PACHYPHYLLA, LEIBERG.

Fig. 1. A plant of natural size showing usual mode of branching.

Fig. 2. One of the sub-simple plants growing with the normal form of Fig. 1.

Fig. 3. Fragment of a branch showing usual position of antheridial inflorescence.

Fig. 4. Calyptra.

Fig. 5. Capsule and perichætium.

Fig. 6. The inner antheridial bract.

Fig. 7. An antheridium

Fig. 8. An old and dry capsule.

Fig. 9. A stem-leaf.

Fig. 10. Fragment of leaf margin from near apex of leaf.

Fig. 11. Upper areolation.

Fig. 12. Medial areolation.

Fig. 13. Basilar areolation, about × 450.

Fig. 14. Cells of the angles and extreme leaf base.

Fig. 15. Section, unprepared, from upper portion of leaf under low magnification.

Fig. 16. Section from middle of leaf treated with dilute nitric acid to bring into view the pluristratose charactor of costa.

Fig. 17. Hair point of leaf.

Fig. 18. Section from lower portion of leaf.

Fig. 19. Three of the teeth of the peristome with fragment of annulus.

All figures except 1 and 2 highly magnified.

Figs. 11, 12, 13 and 14 treated with hot dilute nitric acid to show true forms of cells.

Two New American Mosses.

By G. N. Best.

Buxbaumia Piperi, n. sp. Dioicous; stemless; leaves reduced to yellowish ovate-oblong or palmate, crenate-laciniate bracts; areolation oblong-hexagonal; bracts of fertile plants producing long rhizoids, enveloping the fleshy vaginale in a felt-like mass. Seta about 1 cm., arcuate or flexuose, warty, obliquely inserted. Capsule inclined, ovate-oblong, unsymmetric, greenish becoming pale yellow; section broadly elliptical; upper surface not deeply impressed nor strongly margined; neck distinct; cuticle thin, not glossy or but slightly so, rolling back in segments after the loosening of the broadly conical, obtuse operculum. Columella adherent. The membranaceous endostome composed of linear, papillose, hyaline, fluted segments, lightly cohering by their thickened margins, forming a truncated cone. Peristome of a single layer, with rudiments of a second deeply inserted; teeth linear, reddish or dirty white, papillose, articulated, revolute, lightly connate, fitting into the endostomial grooves, as long or nearly so as the segments. Pseudannulus usually of 3 layers, the inner showing traces of teeth more or less distinct. Spores of medium size.

Hab. On rotten wood, or on ground covered with woody debris, in mountainous regions, probably not rare in the North and West, but either overlooked or when found referred to *B. aphylla* or *B. indusiata.* Mason Co. Wash., Mr. C. V. Piper. Kootenai Co. Idaho, Mr. J. B. Leiberg. Bulletin xvii. 126; xviii. 49.

Remarks: *B. Piperi* is intermediate between *B. aphylla* and *B. indusiata.* The shorter and more curved pedicel, the more erect capsule not markedly depressed nor strongly margined, peristome of a single well developed layer, spores larger, readily separate it from the former. The more symmetrical capsule, peristome of 4 layers, the outer successively shorter, of *B. indusiata* mark it as distinct from the latter. In *B. aphylla* the operculum is usually thimble-shaped, the peristome rudimentary.

Not a little practice is required to manipulate the peristomes and endostomes of these peculiarly interesting plants with satisfaction. The teeth, as soon as they are removed from the grooves of the endostome, in their upper two-thirds, curve outwardly so that their margins approximate, thus becoming obtusely triquetrous, the segments behaving in like manner.

DITRICHUM AMBIGUUM, n. sp. Dioicous; loosely cæspitose; stem rather stout, about 1 cm. long, arcuate-erect, with one or more innovations. Leaves pale yellow, shining, crispate when dry, accrescent upwards, lanceolate-subulate, patent-subsecund, flexuose; lower erect at the half-clasping short base, lanceolate; upper with oblong-erect bases, long lanceolate-subulate, concave, the slightly thickened-involute margins sinuate-dentate; the perichetial with longer sheathing bases, not abruptly narrowed: costa percurrent and dentate on the back in the upper third. Areolation linear, oblong, indistinct above; walls thick, tortuous, striate Seta reddish below, paler above, long, flexuose. Capsule cylindrical, 0.3 cm. long, narrow, straight or slightly curved, reddish, dark brown when deoperculate. Operculum conical-rostrate, blunt, nearly or quite erect, about one-third the length of the capsule. Exothecial cells quadrate-oblong, thick-walled, irregular with a row of smaller ovate-quadrate cells at the mouth. Teeth reddish, long, straight, papillose, nearly or quite split to the rather broad basal membrane; legs filiform except at the slightly flattened connate bases, equal and regular. Annulus large, adherent.

Habitat: moist banks. Mason Co., Washington, Mr. C. V. Piper.

Remarks: Somewhat larger and with firmer cells, yet the leaves of *D. ambiguum* bear a certain resemblance to those of the variable *D. tortile* (Schrad.) Hampe, the capsule and lid to *D. tenuifolium* (Schrad.) Lindb. (*Trichodon cylindricus*, Schimp.), while the peristome differs from that of either. In *D. tortile* the leaves are reflexed to the middle, the capsule oblong-cylindrical, the operculum conical, short-beaked, and the peristome of a more rudimentary type. In *D. tenuifolium* the exothecial cells are linear-rhomboidal, the teeth flattened to above the middle, roughened but not papillose,* the squarrose leaves abruptly narrowed, and the basal membrane not as wide. Notwithstanding the tortuloid peristome this moss is evidently a *Ditrichum*, most closely allied to *D. tenuifolium*, yet quite distinct.

ROSEMONT, N. J.

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* **Braithwaite's British Moss Flora, i. 97.**

The Fossil Aulisci of California.

By J. Deby.

It may be of interest to American microscopists to know that nearly one-third of all known species or forms of the Diatomaceous genus *Auliscus* are to be found in the fossil deposits of California. The Santa Monica and San Redondo earths are the richest localities in the world for these beautiful little forms. I add from personal observations, a list of the California known forms.

Auliscus antiquus, Ratt.
A. Biddulphia, Kitt.
  Var. *prominens*, Ratt.
A. cœlatus, Bail.
  Var. *major*.
  Var. *constricta*.
A. compositus, A. Sm.
A. decoratus, Ratt.
  Var. *affinis*, Ratt.
A. elaboratus, Ralfs.
A. elegans, Ratt.
  Var. *Californica*, A. Sm.
  Var. *Grunowii*, Ratt.
A. eximius, Ratt.
A. gracillimus, Ratt.
A. Hardmanianus, Grev.
  Var. *futilis*, Ratt.
  Var. *bifurcata*, Ratt.
A. insignis, Cleve.
A. intestinalis, A. S.
A. Joynsonii, A. S.
A. Macrœanus, Grev.
A. mirabilis, Grev.
A. ovalis, W. Arnott.
A. punctatus, Bail.
A. pruinosus, Bail.
A. sculptus, Ralfs.
A. speciosus, A. Sm.
A. Stockhardtii, Jan.=*A. racemosus*, Ralfs.
A. subreticulatus, Ratt.
A. subspeciosus, Ratt.,

besides a few undetermined and probably new forms seen by myself and by my friend, Dr. D. B. Ward, of Poughkeepsie, N. Y.

The above list comprises 31 named forms, all of which are in my collection, but out of which the Rev. Francis Wolle, in his Diatomaceæ of North America, only mentions 17, leaving 14 ignored. He, however, adds *A. incertus*, A. Sm. as from Santa Monica and A. *Peruvianus*, Grev. from "California," as fossil? He also mentions *A. mutabilis*, Grev. from Monterey, but no such species of Greville exists. Probably *A. mirabilis* was intended. It is seen from the above that 33 forms of *Aulisci* are at present known from the California diatomaceous deposits, which, during the earlier tertiary periods, must have been the veritable metropolis of the species of this interesting genus.

As I propose preparing a revision of the *Aulisci* in general, I should be glad to receive any additions to the above list from Californian localities, or the loan of any supposed new forms to be added to the existing ones.

31 Belsize Avenue,
London, N. W.

Notes on New Characeæ.

By T. F. Allen.

A new species of Nitella from the Valley of Mexico, collected in December, by Mr. Pringle, I decide to name *Nitella formosa.* It may be described concisely as Nitella diarthrodactyla, homoeophylla, monoica, flabellata, gymnocarpa, closely related to *N. tenuissima*, Kütz. It has the appearance of a gigantic *tenuissima*, attaining the size of 12 to 18 inches in length and diffusely branched. It differs, however, from *tenuissima*, not only as regards its size, but in that the fruit is subterminal only. The oospore is slightly larger than *tenuissima*, in the new species averaging about .340 mm. long by .305 mm. wide, with seven striæ. The membrane of the oospore is minutely granular, while that of *tenuissima* is covered with much coarser granules or reticulations.

I have also received from Japan a new *Nitella*, which is allied to our *Nitella oligospira*, and as in our species, the oogonium is single. The terminal extremities of the enveloping cells of the oospore become contracted, leaving spaces between the cells beneath the coronula of mature specimens; the oospore is .340 by

.285 mm., and its membrane is covered with conical elevations. This species I call *N. Japonica*.

A new variety of *Chara Hydropitys*, which I propose to call var. *Mexicana*, has been collected by Mr. Pringle. The stem and leaves are very slender, the stem .260 mm. diameter, the leaves .230 mm. in diameter. The leaves are ten in number in the verticil, with six or seven nodes, the lowest of which is naked: three or four of the nodes are corticated: there is usually one naked terminal with four or five bracts, like a tuft, all of equal size. The antheridium .245 mm. in diameter, the oospore .435 mm. long by .245 mm. wide, with nine or ten faint striæ. The spines on the stem are very small and scattered, broad at the base .040 mm. broad and .035 mm. long.

A new variety of *Chara gymnopitys*, to be known as var. *Keukenis*, from Lake Keuka in the State of New York. The cortex of the stem is irregular, the plants very small, and, from this locality, very much encrusted with lime. The oospore is .440 mm. long by .260 mm. wide, with nine very faint striæ. The antheridium is .300 mm. in diameter.

A Neglected Species of Hieracium.

By N. L. Britton.

(Plate CXLV.)

Hieracium Greenii, Porter and Britton, n. sp.

Pilosella spathulata, Sch. Bip. Flora, xlv. 439 (1862), not *H. spathulatum*, Sheel. *H. Marianum*, var. *spathulatum*, A. Gray, Syn. Fl. i. Part ii. 455 (1886).

Stem glabrous up to the branches, erect, rather slender, leafless or rarely with 1 or 2 leaves, 1½°–2½° high. Radical leaves tufted, ascending, broadly spathulate, oblong or obovate, obtuse at the apex, narrowed at the base, mostly petioled, glandular-denticulate or entire, villous-pubescent or somewhat hispid on both sides, 4′–7′ long, 1′–2′ wide; heads corymbose-paniculate, several or numerous, 30–40-flowered, rather slender-peduncled, 8″–10″ broad; peduncles and branches canescent-tomentose and glandular; involucre 5″ high, its bracts in 1 series, linear, acute, densely pilose and glandular; flowers bright yellow; achenes columnar, truncate; pappus not copious, brownish.

In dry soil, Tuscarora Mountain, Huntingdon Co., 1845 (Porter); Two-Top Mountain, Franklin Co., Penn., 1846 (Traill Green); Mountains of Clinton Co., Penn., 1842 (McMinn); Peaks of Otter, Virginia (Britton). May-June.

Differs from *H. venosum*, L., in its more elongated, villous-pubescent leaves, stouter stem, larger heads and very pilose and glandular, principal bracts of the involucre.

Differs from *H. Marianum*, Willd., in its entirely glabrous, leafless or very rarely 1–2-leaved stem, larger heads and pilose-glandular involucre.

Botanical Notes.

Note Explanatory—Several wide-awake botanists have noticed a mistake in nomenclature made in my article on "Orchids" in the February number of the BULLETIN, and uttered remonstrances. It is a good sign to see that innovators are held responsible for a strict application of their own principles, and I am quite ready to confess it when I go astray. On page 33, *Cathea*, of Salisbury, is substituted for *Calopogon*, of Robert Brown. This is entirely wrong if we follow the rules recently adopted at Rochester and accept the Species Plantarum of Linnæus of 1753 as our starting point. The name in that case should be *Limodorum tuberosum*, L. Sp. Pl. 950 (1753). The mistake in the text arose from a *lapsus emendationis*. That article was written before the Rochester meeting, and designed as a paper to be read before the A. A. A. S. Botanical Club. At that time I had taken Linnæus' first edition of the Genera (1737), as my starting point for genera, and under that rule *Cathea* would be correct. Unfortunately in the revision of the paper for the BULLETIN, I neglected to make the proper correction for this genus, although it was done in other parts of the same paper.

A word further may be said in regard to *Limodorum*. The deviation from the Linnæan name seems to have began with Swartz in 1799 (Act. Ups. vi. 78), who adopted it from Tournefort. He was followed by Willdenow in 1805 (Sp. Pl. iv. pt. i. 105), who called our plant *Cymbidium pulchellum*, and applied the name *Limodorum* mainly to various species of *Epidendrum*, which he separated from that genus. Subsequently L. C. Richard applied this name to a single European species (*Orchis abortiva* L.), in which he has been followed by Bentham and Hooker. So far as I know, Michaux is the only botanist since the time of Swartz who has adhered to the Linnæan name *Limodorum tuberosum*. Everybody has followed in the wake of Brown and called the plant *Calopogon pulchellum*. THOMAS MORONG.

Note on Trifolium medium.—We received last July from Mr. Ira Parker, of Houlton, Me., some very interesting specimens of *Trifolium medium*, L. in which the heads were replaced by compound umbels, more or less completely formed. The specimens showed every gradation from compound umbels with very short pedicels to those with pedicels fully two inches long. The flowers were all pale, smaller than normal and apparently abortive.

Mr. Parker informs us that several stalks from the same root were similarly malformed. The tendency to vary in the direction of a compound umbel is an interesting confirmation of the general belief that the head is a sessile umbel. F. L. HARVEY.

ORONO, ME., JAN. 15, '93.

Variegation accounted for.—Last week some Callas were brought to me because of their peculiar construction and coloration. One stalk had, for example, a large spathe and two smaller ones within, thus constituting what is commonly known as a "double" calla. Another stalk had a "bloom" with the ordinary single spathe, but close to and enclosing it was a leaf that might at first be easily mistaken for the ordinary spathe. It, however, had a petiole of an inch in length, and the venation was strictly that of a calla leaf, while in color it was white with the exception of the tip and the outer border, which was green. A leaf separate from the examples above mentioned was also brought. It had the long petiole and the ordinary shape of a calla leaf, but fully a quarter of the central portion of the blade was white, and the etiolated part blended gradually with the surrounding green. The three samples gave the whole story of the intimate condition between the spathe and the ordinary calla leaf, and the "variegation" of the latter seemed only a result of a tendency to become a spathe in color, if not in shape. BYRON D. HALSTED.

RUTGERS COLLEGE, Jan. 27, 1893.

Reviews of Foreign Literature.

A Contribution to our Knowledge of Seedlings. By Sir John Lubbock, Bart., M. P., F. R. S., D. C. L., LL. D. (Kegan Paul, Trench, Trübner & Co., London, 1892).

Sir John Lubbock has in this work made a very important contribution to our knowledge of plants. The work occupies a field which has heretofore received comparatively little attention. Works upon systematic botany have been compiled repeatedly, until now Bentham and Hooker's "Genera Plantarum" may fairly be supposed to include nearly all the forms of spermatophytes entitled to stand as genera. In the meantime there remains much to be done in the way of research upon the life-histories of these plants, especially upon the structure of the embryo and its germination. It is into this field that Sir John Lubbock has pushed with characteristic vigor, and the result is this work "On Seedlings" in two volumes, and each volume of over 600 pages.

In the short preface the author briefly states the subject of his work, and mentions those who have assisted him in it. The first 77 pages are devoted to an introduction consisting of generalizations upon the several parts of the embryo both before and during germination. Following this are about 1119 pages, devoted, 1st, to seeds and their germination in the order as a whole, and 2d, a detailed description of the seed, their germination, and the seedlings of the species studied in the order. Species representing nearly every order in Bentham and Hooker's "Genera Plantarum" were studied. The arrangement of orders is the same as in that work, of which, indeed, this work on seedlings might well be considered a fitting supplement. The following are the orders in which the largest number of species were studied: Ranunculaceæ, 26 species; Cruciferæ, 57 sp.; Malvaceæ, 26 sp.; Leguminosæ, 95 sp.; Rosaceæ 22 sp.; Onagrarieæ, 20 sp.; Compositæ, 91 sp.; Labiatæ, 25 sp. A third part of the work is devoted to the bibliography of the subject in two divisions, 1st, general; 2d, special. Finally, a full index is appended.

The introduction is the part of the work that will excite most attention. Many facts are incorporated in it which have already been recorded, especially that part of the descriptions which detail the development and structure of the ovule and the position of the parts of the embryo in the seed; yet the author has ventured to go farther than anyone before him, and has pointed out just how different forms of embryo have originated. This gives to the old facts a new charm. As the author informs us on the first page, these propositions have already been made in the "Jour. Linn. Soc. Vols. xxii.-xxiv.," and as he now reprints them, we feel assured that his confidence in his own interpretation of nature is not shaken by subsequent observation and reflection. All may not agree with him in his interpretations, but no one can question his accuracy of observation. It remains for his critics to draw conclusions which will harmonize better with the facts. Some of these propositions may be profitably mentioned.

1. The inversion of the ovule is of advantage to the plant in that it brings the micropyle in such a position as to increase the probability of fertilization. Here the author confirms the conclusions of others and promises "to enter into the question more fully on a future occasion." The writer of this review has suggested an entirely different explanation of this modification of the ovule and seed, i. e., that it is due to the advantage gained by the correlation of the parts of the embryo, to the external appendages of the seed, thereby securing a favorable position for the embryo during germination. (See "Science Vol. xx. No. 504, September 30, 1892.")

2. Unequal, unsymmetrical, lobed, and auricled cotyledons are to be explained by the crowding of the embryo in the seed, and its tendency to occupy all the available space within the coats.

3. The position of the embryo is often changed to accommodate its parts to the form of the seed. Embryos with accumbent and incumbent parts are, in many cases, thereby explained. "Now if from the form of the pods, or for any other reason, it is an advantage that the seed should be compressed, then the thickness of the cotyledons remaining the same, it is better that the radicle should be accumbent; while on the other hand, in a thicker or globular seed the incumbent arrangement is most convenient." In general, the author believes that the form of the seed determines the form of the embryo.

4. It seems desirable that the cotyledons should be raised above the surface of the ground. This leads to a correspondence between the length of the hypocotyl and the length of petiole of the coty-

ledons. The general rule is then "that the cotyledons are sessile when they are raised by the growth of the hypocotyl, while they are petiolate when they take their origin close to the ground." Connate petioles serve the purpose of forming a stronger support for the cotyledons than would be afforded if they remained separate.

5. Narrowness of the cotyledons or their division into narrow segments is attributed to the greater facility with which they may be withdrawn from the seed-coats. Also, narrowness of the cotyledons in some cases "enables the plant to make them lie conveniently in a globose seed."

The generalizations with which each order is introduced, are especially interesting and valuable. Here, as well as in the description of each species, the cotyledons are given prominence. The Onagrarieæ is as fair a choice among the orders as could be made. The seedlings of quite a number of its species have cotyledons in which a secondary growth occurs. The seedlings of *Œnothera Bistorta* are described as follows:

"Immediately after germination the cotyledons are oblong, obtuse, entire, sessile with a few long, scattered, glandular hairs, especially at the base. Hypocotyl with a few glandular hairs at the apex. Cotyledons often unequal, owing to their greater or less development in the seed, and one folding over the other.

"Six days after germination the base has become elongated, petiole-like, and glandular-pubescent, suddenly narrowed to a short petiole, or subsessile; the upper half remains rotund and glabrous except at the base and possibly a few short hairs underneath.

"Eight days after germination (fig. 367) they have elongated considerably, the upper true cotyledonary part enlarging, but otherwise remaining unaltered, while the foliar basal and narrow part has become linear, entire or sometimes with a minute tooth on either side, glandular-pubescent, suddenly narrowed at the very base.

"The lower portion elongates greatly, and the ultimate stage of the cotyledons (fig. 368) is linear, tapering at the base into a petiole; upper part or true cotyledon rotund or oval, entire glabrous, very short without midrib, lower part linear terminating abruptly in the upper part, tapering gradually to the base, with one or two minute and distant teeth on each side, thinly hairy, greyish-green with an evident midrib sunk on the upper surface, and prominent beneath; petiole subterete, flattened above, very thinly hairy, or at length nearly glabrous.

"First eight leaves radical, alternate, linear, obtuse, tapering at the base into the petiole, thinly silky with appressed pubescence, minutely and distantly toothed at the margin, greyish green, more or less distinctly marked near the margin with black dots, with a very distinct, colorless mid-rib, flattened above, thinly hairy at the margins, colorless. (Thirty-four days after germination.)"

One of the striking features of the volumes to students especially interested in American plants, is the small number of North American species studied. Descriptions of seedlings of several garden vegetables are included. Among these, most prominent, perhaps, are the common radish (*Raphanus sativus*), common bean (*Phaseolus vulgaris*, tomato (*Lycopersicum esculentum*) and pepper (*Capsicum* sp.). Seedlings of many cultivated ornamental species are studied. Many of the species are rarely seen outside of Kew Gardens.

The author uses the old term "radicle" as a name for the axis of the embryo while in the seed, but steadily applies the word "hypocotyl" to the same organ during germination. The beginnings of the root-system of the plant is scarcely touched upon, although the origin of the first roots have been shown by Holm (Mem. Torr. Bot. Club. Vol. ii. No. 3) to determine in a considerable measure the habit of the plant.

The volumes are profusely illustrated with outline sketches.

All will agree, I think, that more such books are needed. It is only when as careful researches are made upon the life-histories of seed producing plants, as cryptogamic botanists find themselves obliged to make upon the lower plants, that we shall discover how much yet remains to be done to complete our knowledge of the Spermaphytes. There are many fields as inviting as was the one chosen by Sir John Lubbock. W. W. ROWLEE.

On the Simplest Form of Moss. Karl Goebel. (Ann. Bot. vi. 355–360, Plate XXII. 1892).

The author considers *Buxbaumia* an almost ideally simple moss, because the sexual organs are borne almost directly on the protonema, in this approaching the ferns. The protonema is said to be similar to that of certain species of *Trichomanes*, and is compared with that of *Sphagnum*, *Andreæa* and *Metzgeriopsis*. The sporogonium is said to be most nearly allied to that of *Diphyscium*, and to possess no true seta, as the calyptra is ruptured by the expansion of the theca, and not by the elongation of the pedicel, as in the true Bryineæ. The plate illustrates the variation of the sporophylls in *Onoclea Struthiopteris*, and *Botrychium Lunaria*. The alliance with *Diphyscium* is contrary to the views of Lindberg and Braithwaite, though more in harmony with those of all the older authors, and most modern ones. Also the growth of the sexual organs upon the protonema, and the complexity and variability of the peristome would seem rather to indicate a higher organization.

The paper noticed above abounds in theories of the most slender probability, stated as ascertained facts. For example, in a paragraph of eleven lines (p. 357) the following propositions are given.

1. The organization of the sporogonium of *Buxbaumia* "is rudimentary as compared with that of the true Bryineæ."

2. "It somewhat recalls that of *Sphagnum* and *Andreæa*."

3. "It has no true seta, but merely an absorbent organ which penetrates into the rudimentary stem of the moss-plant."

4. "This organ gives off a number of rhizoids which absorb nourishment from the stem."

5. "Consequently in this form the calyptra is ruptured, not by the elongation of the seta as in the Bryineæ, but by the expansion of the theca of the sporogonium."

As Professor Goebel gives no reasons for his inferences, discussion is out of the question. The apparent statements of fact are contrary to the conditions observed in a recent study of *Buxbaumia*, which gives, in the main, the same results as those of Schimper, from whose descriptions and plates it appears that the capsule (especially of *B. indusiata*) is, if anything, the most complex of any of the mosses; the seta is entirely homologous with that of other mosses, does not give off rhizoids, but fits into a socket of the short stem, and ruptures the calyptra by elongation.

The fact that the marginal cells of the leaves of *Buxbaumia* grow out into long filaments is given as a reason for supposing hat the leaves of this genus are in some way more *protonemal* than those of other mosses, regardless of the facts that *B. Favanica* has entire leaves, and that there are plenty of instances among mosses and hepaticæ where the marginal cells and even those of other parts of the leaf are produced into cilia. Indeed, Professor Goebel seems here to have undertaken a gratuitous labor, for all are agreed that the plant body in mosses and foliose hepaticæ grows from the protonema. The peculiarity of *Buxbaumia* in the respect seems to be that it does not grow so large.

The strangest thing about *Buxbaumia* is, perhaps, its physiological arrangement. The sexual generation, instead of leading the life of a parasite upon its parent, as in other mosses, is richly provided with chlorophyll, and apparently needs the parent only as a means of attachment to the substratum. O. F. Cook.

Bulletin de l'Herbier Boissier. Sous la Direction de Eugène Autran, Conservateur de l' Herbier. (Tome i. No. 1, 8vo. pp. 32, avec deux planches, Geneve, 1893).

We chronicle with much pleasure and interest, the appearance of another new journal, published under the auspices of the great herbarium of M. Boissier at Chambesy, near Geneva. It is planned to issue the Bulletin as material becomes available, and to produce a volume of 400 pages each year. The first number contains two papers: (I) Les Genres *Achatocarpus*, Triana et *Bosia*, L., et leur Place dans le Systeme Naturel by Dr. Hans Schinz and M. Autran, illustrated by two plates. *Achatocarpus* is a South American genus placed by Triana in relationship with *Rivina* in the Phytolacaceæ, where MM. Schinz and Autran conclude it belongs. It is referred by Bentham and Hooker to the Amarantaceæ and by Baillon to the Chenopodiaceæ. Four new species are described, all Paraguayan.

The second paper is by Dr. Geo. E. Post, and is Part V. of his descriptions of and notes on Syrian plants. N. L. B.

Proceedings of the Club.

Tuesday, February 14th, 1893.

The President in the chair and thirty-five persons present.

Mrs. L. Brück, of Hoboken, N. J., and Mr. Geo. M. Beringer, of Camden, N. J., were elected active members.

The assent of the Club was given to a proposition of the Council of the Scientific Alliance of New York, that a joint meeting be held in memory of Prof. John S. Newberry.

The first paper of the evening was then read by Dr. H. H. Rusby, entitled "Account of some new Species of Polypetalæ from Bolivia." The paper was a report upon the study of 280 numbers collected by Mr. Miguel Bang, representing 271 species and varieties, of which 58 were unknown and 4 others were represented only by manuscript names or by names published without descriptions. The specimens of these new species were exhibited, a number of them being compared with other specimens exhibited of related species. Dr. Rusby announced that his method of publishing his enumeration of Mr. Bang's plants would be in sets of 1000 numbers, each set being published in two parts, each part to constitute a number of the Memoirs of the Club. The first part, running through the Compositæ of the first thousand numbers, would occupy a number of the next volume of the Memoirs.

The second paper was then presented by Mr. Henry Kraemer, being his report as chairman of the Field Committee for 1892. The report was remarkably full in the enumeration of every detail connected with the work of the committee, and was filed with the Secretary.

Dr. Britton spoke of two forms of *Vaccinium vacillans*, collected at Forked River, N. J., and exhibiting two markedly distinct forms of corolla. His attempts to associate these with the corresponding fruits had not up to the present proven satisfactory. He also referred to the *Rubus villosus*, var. (?) *humifusus*, which had now turned up in a number of localities.

An interesting discussion followed on the appearance and habit of the *Nelumbo lutea*. Mr. Rudkin, in reply to a question by the President, stated that the plant had not only held its own at Swartzwood Pond, N. J., but had increased greatly. It was found in full bloom about the 1st of August. The flowers are 9 or 10 inches in diameter, and the petals are few and loose as compared with those of *Castalia*; the largest leaves are 2 feet or more in diameter. Dr. Morong remarked upon the great length and increasing thickness downward of the portion of the plant which was imbedded in the mud; in this respect it is similar to the *Orontium aquaticum*. So large and thick are these portions that the plant bears removal very well, being capable of transportation to long distances.

Dr. Britton exhibited a copy of Prof. Conway Macmillan's "Metaspermæ of the Valley of the Minnesota," which he regarded as the most extensive and complete local flora ever produced. It is published by the Geological Survey of the State of Minnesota.

WEDNESDAY EVENING, FEBRUARY 22d.

Vice President Morong in the Chair and seventeen persons present.

The following papers were read:

"A Memorial of Professor John Strong Newberry," by N. L. Britton. The paper was illustrated by specimens of plants named in honor of Prof. Newberry and by a portrait, and is published in this number of the BULLETIN. Remarks were made by Dr. Arthur Mead Edwards, Mr. Lighthipe and the Chairman.

"Notes on some plants of the Yadkin River Valley, N. C.," by John K. Small. The paper was copiously illustrated by specimens and was discussed by Dr. Britton and Dr. Morong.

Index to Recent Literature Relating to American Botany.

Additions to the State (*Indiana*) *Flora from Putnam County.* Lucien M. Underwood (Proc. Ind. Acad. Sci. 1891, 89–91).

Eustichia Norvegica is reported from sandstone rocks at Fern, the fourth station in America.

Bread-Fruit Trees in North America. F. H. Knowlton (Science xxi. 24, 25).

The author traces the former existence of the genus *Artocarpus* through the North American continent to Greenland, in cretaceous and tertiary times, as evidenced by remains which are manifestly to be referred to this genus, although classed by different authors at various times under the genera *Myrica* and *Aralia*.

A. H.

Characeæ of America. T. F. Allen (Part II. Fascicle 1, large 8vo., p. 8, 14 plates; published by the author, 10 E. 36th St., New York).

The first part of Dr. Allen's work on our Characeæ was published several years ago. It deals with the morphology, life history and affinities of the group, their classification, and contains a tabular key for the identification of genera and species. This first installment of Part II. deals with eight species of *Nitella*, several of which are new. It is begun by a revised synoptical key to the thirteen species which Dr. Allen now has from America, five of which he has made known. Fourteen plates are issued with the fascicle, eight of them lithographs and six photogravures, made directly from herbarium specimens, and illustrating very well the habit and mode of branching of the plants. N. L. B.

Compositæ—Observations on the—II. Edward L. Greene (Erythea, i. 41–45).

Prof. Greene refers his recently proposed genus *Biolettia* to *Trichocoronis* and discusses *Eupatorium* and its allied genera.

Coniferæ—Notes on West American, I. J. G. Lemmon (Erythea, i. 48–52).

Mr. Lemmon describes his new varieties of *Pseudotsuga taxifolia*; one, var. *suberosa* from Arizona and New Mexico; the other, var. *elongata* from the base of Mt. Hood, Oregon. He also takes issue with Dr. M. T. Masters as to the common name of this tree, maintaining that it should be Douglas Spruce, not Douglas Fir.

Corky Excrescenses on the Stems of Zanthoxylum—The Nature and Development of. C. A. Barber (Annals of Botany, vi. No. 22)

The author first describes the development of the thorn at whose base the corky cushion always originates. The thorn is said to complete its growth during the first summer, growing from a zone of meristematic cells near its base. In the autumn begins the development of the cork-cells, probably from the same meristem which produced the cells of the thorn, though the author does not expressly state this. Yearly deposits of this cork-tissue are made which he compares to the annual rings of *Pinus* stems. As this cushion increases, the tissues near the base of the thorn gradually weaken; finally a rupture occurs by which it is detached, sometimes leaving a slight scar. In regard to the biological significance of this corky growth no explanation is attempted; as to determine this he says a careful study of the plants in their native surroundings is necessary. In some general notes on cork formation in thorns of different plants, several explanations of other authors are given. In conclusion, the author gives a list of plants whose thorns have basal cork formation. This list is taken in part from Gamble's manual of Indian timbers and, in part, from specimens found in museums and botanical gardens.

E. L. G.

Crossing of Cucurbits, L. H. Pammel (Bull. 19, Iowa Exp. Station).

Prof. Pammel records the results of a large number of tests in crossing pumpkin (*Cucurbita Pepo*), squash (*C. maxima*), watermelon (*Citrellus vulgaris*), musk melons (*Cucumis Melo*), and cucumbers (*Cucumis sativus*). While there was great variability in some species as in the pumpkins and squashes, this was due to the seed used and not an immediate effect of crossing. The result of the cross is seen only in the offspring, not in the fruit.

B. D. H.

Cypripedium fasciculatum, var. *pusillum*. (Bot. Mag. t. 7275).

Dr. Hooker refers *C. pusillum* Rolfe, Kew. Bull., 1892, 211, to this species.

Distribution of Tropical Ferns in Peninsular Florida. Lucien M. Underwood. (Proc. Ind. Acad. Sci. 1891, 83–89).

Eclogæ Botanicæ, No. 1. Edward L. Greene. (Proc. Acad. Nat. Sci. Phila. 1892, 357–365; issued Feb. 6, 1893).

This contribution of Prof. Greene is devoted to (1) New or Noteworthy Thistles, in which the conclusion is expressed that all our species should be included in the Linnæan genus *Carduus*, the name *Cnicus* being applicable only to *Centaurea benedicta*. Most of the Eastern species have already been named under *Carduus*; the others are here transferred and ten new ones characterized, which will much facilitate the naming of undetermined material; (2) Three new Perennial Lupines: *Lupinus floribundus* from Colorado, *L. gracilentus* and *L. Covillei* from California. N. L. B.

Economic Fungi.—Fascicle V. Profs. Seymour and Earle. This contribution, embracing numbers 201 to 250, includes thirteen families of plants among the hosts, two of which, the Rosaceæ and Coniferæ are largely represented, the former containing the æcidial and the latter teleutosporic forms of several species of *Gymnosporangium*. The mycologist will be particularly interested in the specimens of *G. Bermudianum* (Farl.) Earle, which strangely has both the æcidial and teleutospore form upon the same galls of the jimpson as found by Mr. Earle in Mississippi. Professor Galloway's new species, *Coleosporium Pini* is included and many other interesting Uredineæ. B. D. H.

Epidendrum spondianum (Bot. Mag. t. 7,273).
Native of Jamaica and Costa Rica.

Epigæa repens (Meehan's Month. iii. 17, 18; colored plate).

Flora of Mt. Orizaba. Henry E. Seaton. (Proc. Ind. Acad. Sci. 1891, 80–92).

Gases in Living Plants. J. C. Arthur. (Amer. Nat. xxvii. 1–8; 98–105).

Glumifloren des nordlichen Ohio. Edo. Classen. (Pharm. Rundsch. xi. 33–34).

A list of 70 Cyperaceæ and 78 Gramineæ from the northern counties of Ohio.

Grasses of Pennsylvania—List of the. Thos. C. Porter. (Leaflet, pp. 4).

A list of 166 species and varieties accompanying the exhibition of the specimens of Pennsylvania Grasses, prepared by Prof. Porter for the State Agricultural Societies exhibit at the Columbian Exposition.

Griselinia—Revision der Gattung. P. Taubert. (Engl. Bot. Jahr. xvi. 386–392).

Description of seven species of this New Zealand and South American genus of Myrtaceæ. We are interested in observing that Dr. Taubert adopts the parenthetical citation of previous authors.

Hardwoods of Oregon—The. Francis E. Lloyd. (Hardwood, iii. 10–11). Notes on fourteen species.

Lathyrus sylvestris. A New Fodder Plant. (Bull. 2, Va. Exp. Station.) The whole bulletin is given to the merits of this plant for fodder.

Malvaceen—Beitragé zur Systematik der. Max Gürke (Engler's Bot. Jahrb. xvi. 330–385).

A new treatment of the genera *Malachra* and *Urena.*

Morphological Notes. S. B. Parish (Erythea, i. 45–47; E. L. Greene, l. c. 52).

Description of lateral flowering in *Agave Americana*, and remarks on the nature of the petiolar glands in *Armeniaca vulgaris*, which, it is suggested, represent the petiolules of reduced leaflets.

Nematophycus Storriei, nov. sp. C. A. Barber (Ann. Bot. vi. 329–338, Pl. XIX. XX).

The plant originally described by Dawson as *Prototaxites*, from the Devonian rocks of Canada, and afterwards studied and renamed by Carruthers as *Nematophycus*, on account of its evident algal affinities, were made the subject of close microscopic examination by the author, in connection with specimens of *Pachytheca*. As a matter of interest it may be here noted that these genera, and *Chara*, are almost the only fossil algæ in which well defined structure is apparent, and the first two were long suspected to be merely parts of the same plants. The specimens of *Nematophycus* upon which the new species is founded, were obtained from the Tymawr quarry at Cardiff, Wales, in rocks of the Wenlock (Upper Silurian) age, associated with remains previously indentified as *Pachytheca.*

In addition to the full description of the new species a description is given, for the purposes of comparison, of *N. Logani* (Daw.) Carruthers, and in the plates both species are made the subjects of numerous studies in longitudinal and transverse sections.

A. H.

Occurrence of Certain Western Plants at Columbus, Ohio. Aug. D. Selby (Proc. Ind. Acad. Sci. 1891, 74–76).

Ornamental and Timber Trees. (Bul. 24, Minn. Exp. Station). This is a large work designed to encourage the growing of desirable plants adapted to the northern conditions. Full lists, in the notes for each sort, are given for deciduous trees, evergreen trees, shrubs, vines and climbing plants, herbaceous plants followed by tables of hardiness.

Palæobotany of the Cretaceous Formation on Staten Island—Additions to the. Arthur Hollick. (Reprint, Trans. N. Y. Acad. Sci. xii. 1–12, Pl. I–IV.) In this contribution the author supplements a previous contribution on the palæontology of the same region, but here giving special attention to the fossil plants. A list of some forty species is given, in which, excluding seeds and fruits of uncertain affinities, there are seven new species described, viz: *Myrica Davisii*, *M. grandifolia*, *Platanus Aquehongensis*, *Kalmia Brittoniana*, *Acer minutus*, *Williamsonia* (?) *Riesii*, and *Phyllites poinsettioides*. All species enumerated are figured in the accompanying plates, and many of them are recognized as identical with the species described and figured by Prof. Heer from the Atane and Patoot beds of Greenland, by Prof. Leo Lesquereux from the Cretaceous of the Western United States, and by Ettingshausen and Velenoosky in Europe. Another important link in the chain of vegetation during Cretaceous times is thus established.

Pammel's Fungus of Texas Root-rot of Cotton—Method of obtaining pure cultures of. Geo. F. Atkinson (Bot. Gaz. xviii. 16–19).

Plant Dispersion by the Buffalo. (Erythea, i. 47, 48).

An anonymous letter is published, its author agreeing with the criticisms of Professor Green on a recent article on this subject.

Plantæ Lehmannianæ in Guatemala, Costa Rica, Columbia, Ecuador etc., collectæ.—Leguminosæ, Marc Micheli. (Engl. Bot. Jahrb. xvi, Heft. 3, Beiblatt, 1–9.)

An annotated list of a large number of species, all previously described.

Portulaceæ—A Rearrangement of American. Thomas Howell (Erythea, i. 29–41).

This valuable paper is in the nature of a synoptical revision of the American species of the order. Its principal feature is the proposal of a new genus, *Oreobroma*, including 10 species taken out of *Lewisia*, *Claytonia*, *Talinum* and *Calandrinia*, all acaulescent perennials with scapose stems jointed at the base and fleshy, edible roots.

Mr. Howell also refers a considerable number of the West Coast plants which have hitherto been in *Claytonia* to *Montia*, agreeing in this with the views recently expressed by Prof. Greene. *Calyptridium nudum*, Greene, is referred to *Spraguea*, and *Spraguea multiceps* is a new species. N. L. B.

Prolification und Phyllodie bei Geum rivale. E. Busherer (Ber. Deutsch. Bot. Gesell. x. 571–576; one plate).

Ranunculaceæ—A Comparative Study of the Roots of. Fred. B. Maxwell. (Bot. Gaz. xviii. 8–16; 41–47. Three plates).

Rio de La Plata; Its Basin, Geography and Inhabitants. Thomas Morong. (Bull. Amer. Geograph. Soc. xxiv. 479–509).

Delivered originally as a lecture before the American Geographical Society, and now printed as an article in its Bulletin, accompanied by a map of the region traversed. This is a running account of a trip made by the author up the rivers Plata, Parana and Paraguay in the year 1888, and a sojourn for the two following years at Asuncion, the capital of Paraguay. Brief descriptions are given of Montevideo, Buenos Aires and Asuncion, the manners of their inhabitants, the character of the pampas and campos, and the characteristics of the rivers and the vegetation upon their banks, ending with a short account of the wild tribes of Indians inhabiting the wilderness of the Gran Chaco in Paraguay.

Root-Pressure—An Apparatus for Determining the Periodicity of. M. B. Thomas (Proc. Ind. Acad. Sci. 1891, 82, 83).

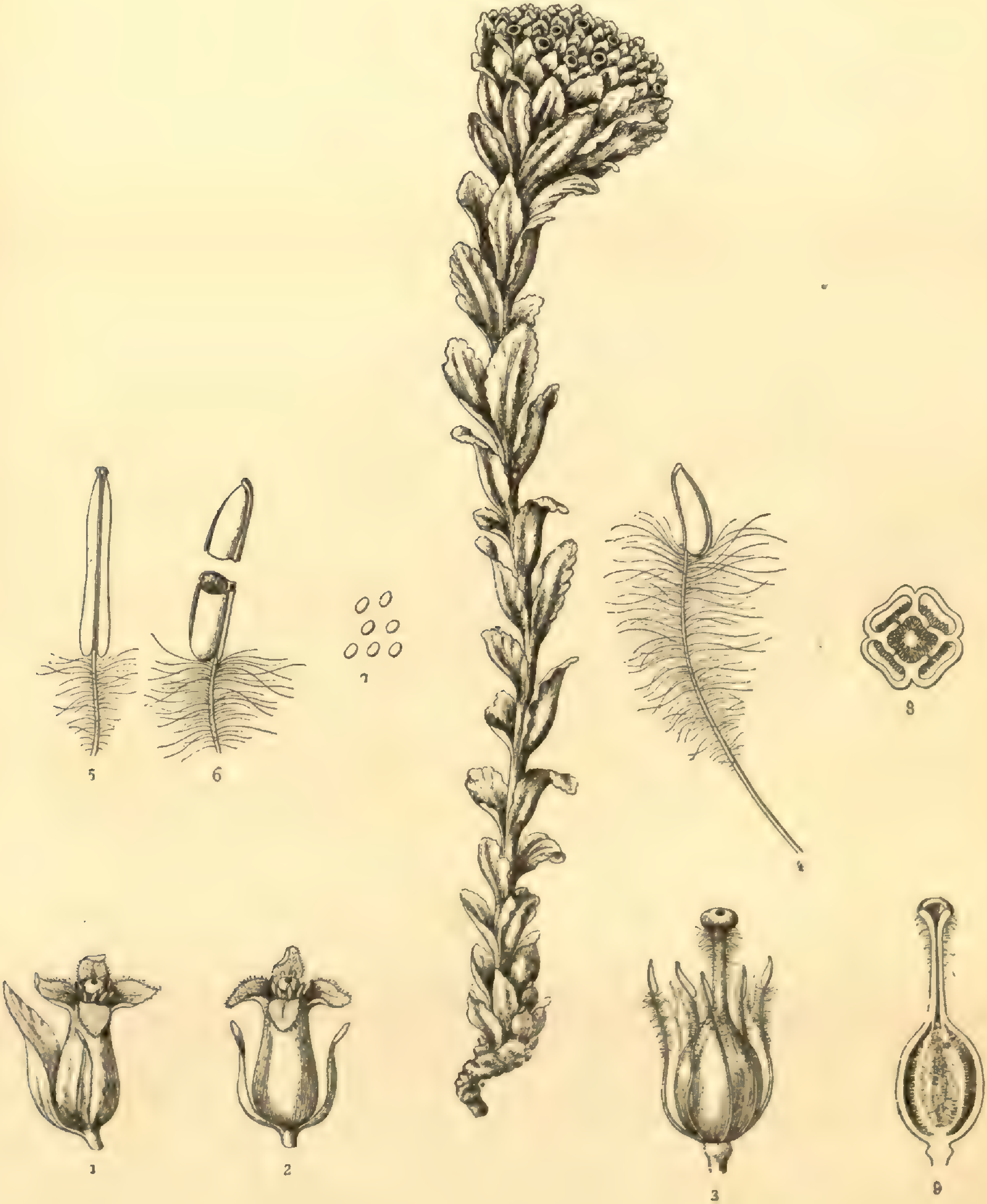
Root Rot of Alfalfa. (Bull. 22 Texas Exp. Station).

A new and serious trouble of fungous origin not yet well known on *Medicago sativa.*

Vacation in the Hawaiian Islands. D. H. Campbell. (Bot. Gaz. xvii. 410–416; xviii. 19–25).

Violæ Chilenses.—Ein Beitrag zur Systematik der Gatting Viola. Karl Reiche. (Engl. Bot. Jahrb. xvi. 403–448).

A descriptive list of 46 species of Chilian Violets, several of which are new.



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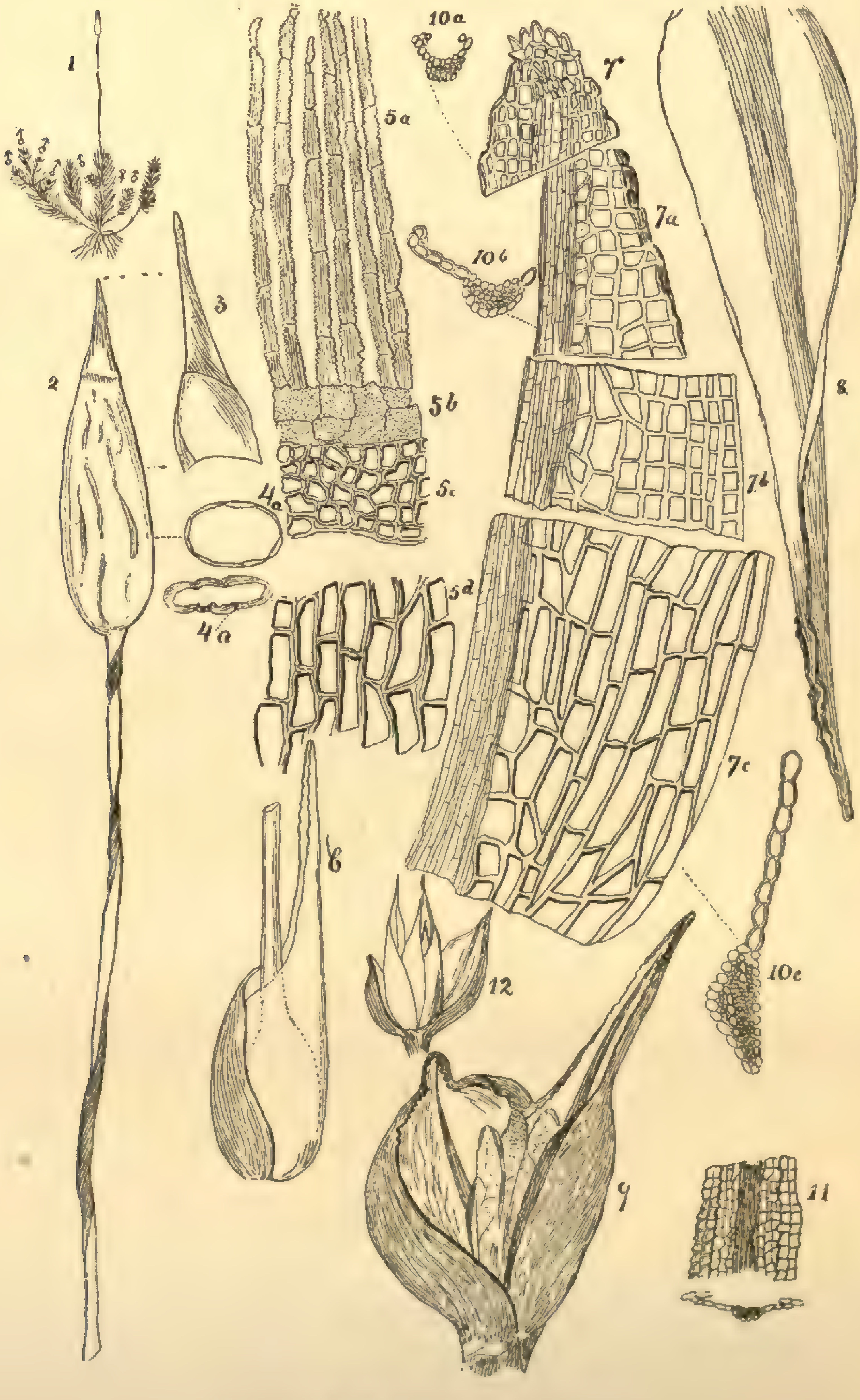
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DITRICHUM MONTANUM, LEIBERG.

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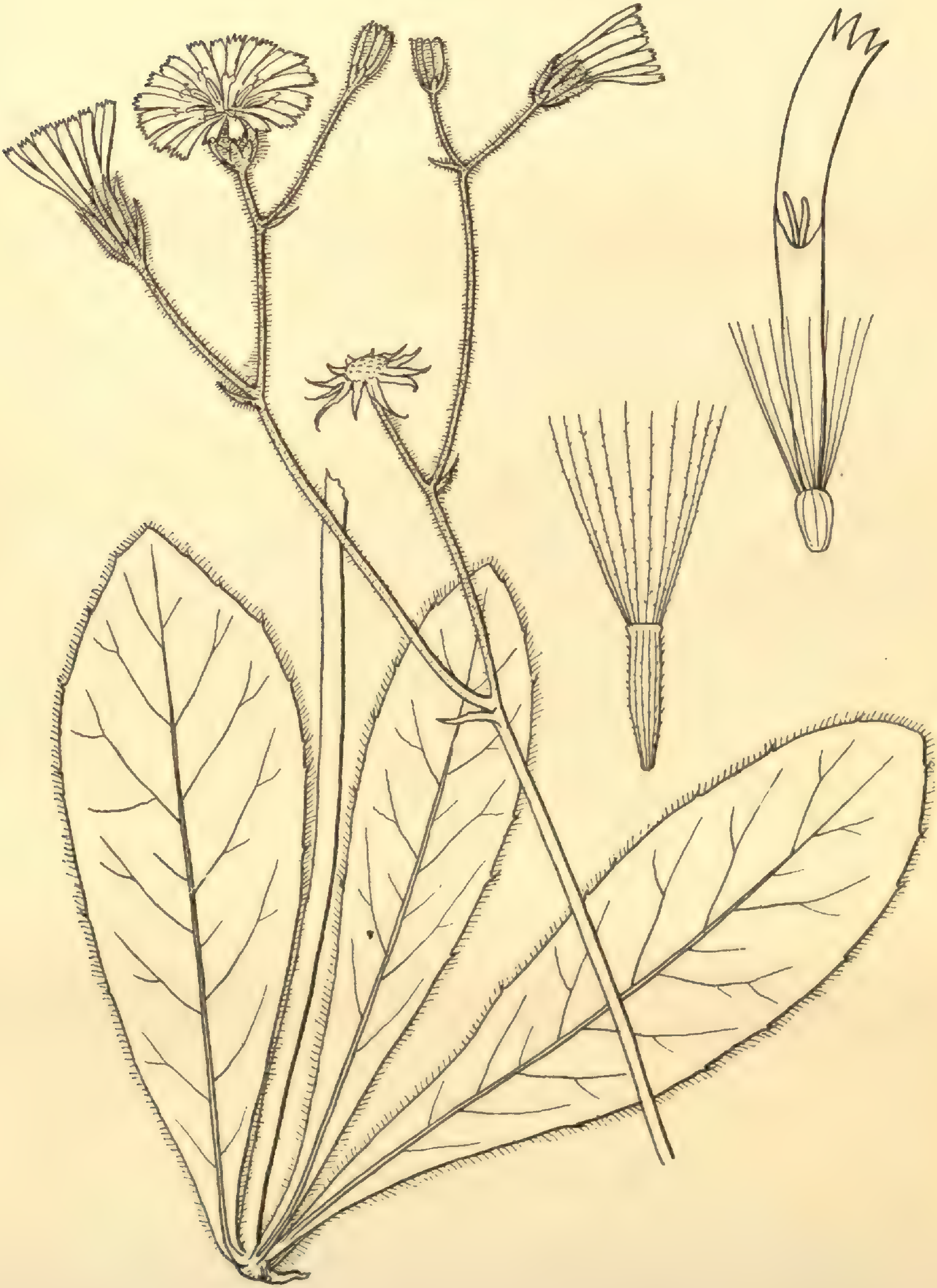
GRIMMIA PACHYPHYLLA, LEIBERG.



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Vol. XX. APRIL, 1893. No. 4.

BULLETIN

OF THE

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EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., April 10, 1893. No. 4.

An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1885-1886.—XXIII.

(Continued from Vol. XIX., page 374.)

VACCINIACEÆ.

Psammisia leucostoma, Benth.; Meisn. in Mart. Fl. Bras. vii. 127. Mapiri, 2,500 ft. (2038). The same as Spruce, No. 2465 from Brazil.

Psammisia pauciflora, Griseb. in Pl. Lechl. Exc. 2386. Mapiri, 5,000 ft. (2037). The same as Lechler, 2386 from Peru. This may be a *Macleania* as indicated by Bentham and Hooker, Gen. Pl. ii. 567.

EURYGANIA ELLIPTICA (R. & P.) (*Thibaudia elliptica*, R. & P. Fl. Per. iv. t. 384, f. B). Mapiri, 2,500 ft. (2219); Yungas, 4,000 ft. (2034).

CERATOSTEMMA HOOKERI, Britton. (*Thibaudia elliptica*, Hook. Icon. Pl. t. 108, not R. & P.). Mapiri, 10,000 ft. (2036).

CERATOSTEMMA MANDONI, n. sp. Sect. Euceratostemma. Ramis glabris, striatis; foliis breviter petiolatis, integris, ovatis vel ovato-oblongis, approximatis, concoloribus, supra glabris, subter parce nigro-punctatis, utriusque obtusis, 1-1.5 cm. longis, 5-8 mm. latis, 5-venosis; pedunculis, calycibusque tomentosis; floribus terminalibus, solitariis geminibusve, 3 cm. longis; calyx 5-fidus, lobi lanceolati, acuti; corolla extus puberulenta, cylindracea, apice 5-fida, calyce 4-5-plo longiora.

Mapiri, 10,000 ft. (2632). Same as Mandon's 748, and probably the same as Lechler's 2693 and 2585 from Gatchapota, Peru, Herb. Kew.

CERATOSTEMMA SERRATA, n. sp. Sect. Siphonandra. Ramulis rugosulis, glabris; foliis breviter petiolatis, ovato-oblongis, utrinque pallidis, subter parce nigro-punctatis, apice acutis, basi rotundatis, margine remote denticulatis, 5-8 cm. longis, 3-4 cm. latis; floribus axillaribus, umbellatis, 3-4 cm. longis; calycibus oblongo-campanulatis, breviter 5-dentatis; corollis glabris, cylindraceis, calyce 2-3-plo longioribus, apice 5-dentatis.

Unduavi, 8,000 ft. (2035).

CAVENDISHIA PUBESCENS (H. B. K.) (*Thibaudia pubescens*, H. B. K. Nov. Gen. iii. 273). Yungas, 6,000 ft. (2033).

Cavendishia, sp. Mapiri, 5,000 ft. (2403).

Vaccinium empetrifolium, H. B. K. Nov. Gen. iii. 263, t. 248 ? Unduavi, 10,000 ft. (2022).

Vaccinium floribundum, H. B. K., l. c. 266, t. 251. Mapiri, 10,000 ft. (2028). The same as Mandon's 551.

Vaccinium didynanthum, Dun. in D. C. Prodr. vii. 575. Mapiri, 10,000 ft. (2026).

Vaccinium epacridifolium, Benth. Pl. Hartw. 221. Mapiri, 10,000 ft. (2027).

Vaccinium polystachyum, Benth, l. c. 140. Mapiri, 10,000 ft. (2024).

Vaccinium pernettioides, Griseb. in Lechler Pl. Excs. 2113a. Yungas, 6,000 ft. (2029). The same as Lechler's 2113a.

Vaccinium, sp. Ingenio del Oro (2021).

Sophoclesia, sp. Mapiri, 5,000 ft. (2696).

Rusbya taxifolia, Britton, Bull. Torr. Bot. Club, xx. 68. Yungas, 4,000 ft. (2692).

ERICACEÆ.

Pernettya Pentlandii, D. C. Prodr. vii. 587. Sorata, 13,000 ft. (2017) Yungas, 6,000 ft. (2018.)

Pernettya Pentlandii, D. C. var. *parvifolia* (Benth.) Wedd. Chlor. And. ii. 170. Unduavi, 8,000 ft. (2023).

Gaultheria anastomosans (L. f.) H. B. K. Nov. Gen. iii. 285. Yungas, 6,000 ft. (2025; 2095).

Gaultheria cordifolia, H. B. K. Nov. Gen. iii. 285, t. 261. Yungas, 6,000 ft. (2016).

Gaultheria brachybotrys, D. C. Prodr, vii. 595. Sorata, 13,000 ft. (2014).

Gaultheria rufescens, D. C. Prodr. vii. 595. Unduavi, 8,000 ft. (2013); 10,000 ft. (2011). The same as Mandon's 557.

Gaultheria reticulata, H. B. K. Nov. Gen. iii. 284. Ingenio del Oro, 10,000 ft. (2030).

Gaultheria glabra, D. C. Prodr. vii. 596. Yungas, 6,000 ft. (2015).

Gaultheria tomentosa, H. B. K. Nov. Gen. iii. 287, t. 262. Unduavi, 8,000 ft. (2032). The same as Mandon's 559.

Gaultheria Pinchinchensis, Benth. Pl. Hartw. 225. Yungas, 6,000 ft. (2012).

Gaultheria conferta, Benth. Pl. Hartw. 219. Unduavi, 10,000 ft. (2020).

Gaultheria vaccinioides, Griseb. Pl. Lechler Excs. 1900. Unduavi, 10,000 ft. (2019); Ingenio del Oro, 10,000 ft. (2031).

Befaria glauca, H. & B. Pl. Æquin. ii. 118, t. 177. Mapiri, 5,000 ft. (2010); Yungas, 6,000 ft. (2123).

Clethra fimbriata, H. B. K. Nov. Gen. iii. 290, t. 264. Unduavi, 12,000 ft. (2073). The same as Mandon's 562.

Clethra Brasiliensis, Cham. Linnæa, viii. 510. Yungas, 6,000 ft. (2091).

PLUMBAGINEÆ.

Plumbago scandens, L. Sp. Pl. Ed. 2, 215. Tacna, Chili (1158); Yungas, 6,000 ft. (1917 and 1073).

MYRSINEÆ.

Myrsine dependens (R. & P.) Spreng. Syst. i. 664. (*M. ciliata*, H. B. K.) Unduavi, 10,000 ft. (2491.)

Myrsine erythroxyloides, Benth. Voy. Sulph. 123. Guanai, 2,000 ft. (867).

Myrsine latifolia (R. & P.) Spreng. Syst. i. 664. Yungas, 4,000 ft. (868).

Myrsine Gardneriana, A. D. C. Ann. Sci. Nat. (II.) xvi. 86. Yungas, 4,000 ft. (866 and 869). The same as Spruce's No. 4251.

GEISSANTHUS BOLIVIANA, n. sp. Arbor glabra. Foliis oblanceolatis, coriaceis, integris, multinervis, subtus dilute viridis, apice obtusis, base cuneatis, 15-20 cm. longis, 5-8 cm. latis; petiolis crassis, 2 cm. longis; floribus 2-3 mm. latis, dense paniculatis; paniculis 10-15 cm. longis; calycibus campanulatis, punctatis, 5-lobatis, tubo lobis æqualibus; corollis calyce duplo longioribus.

Mapiri, 5,000 ft. (562). Related to Spruce's No. 5176, Herb. Kew.

Cybianthus, sp. Mapiri, 5,000 ft. (2346). Collected only in fruit.

Cybrianthus, sp. Guanai, 2,000 ft. (1218). Collected only in fruit.

I did not match either of these at Kew. In all probability they are undescribed species.

Ardisia acuminata, Willd. Sp. Pl. i. 1062. Junction of the Rivers Beni and Madre de Dios (2490).

Clavija spathulata, R. &. P. Syst. Fl. Per. i. 285 (?). Junction of Rivers Beni and Madre de Dios (2650).

Clavija lancifolia, Desf. Nouv. Ann. Mus. Hist. Nat. i. 402, t. 14. Guanai, 2,000 ft. (1219).

SAPOTACEÆ.

Mimusops Surinamensis, Miq. in Mart. Fl. Bras. vii. 43. Junction of the Rivers Beni and Madre de Dios (729).

Lucuma procera, Mart.; A. D. C. Prodr. viii. 170. Falls of the Madeira, Brazil (2618).

Sideroxylon, sp. Junction of the Rivers Beni and Madre de Dios (2703).

STYRACEÆ.

Styrax ovatum (R. & P.) A. D. C. Prodr. viii. 267. Yungas, 6,000 ft. (838).

Symplocos Matthewsii, A. D. C. Prodr. viii. 250. Mapiri, 5,000 ft. (2686).

Symplocos, sp. Mapiri, 2,500 ft. (2685).

OLEACEÆ.

Jasminum grandiflorum, L. Sp. Pl. Ed. 2, 9. Yungas, 6,000 ft. (1244). Cultivated and escaped.

The Development of the Sporocarp of Pilularia Americana, A. Br.

BY DOUGLAS HOUGHTON CAMPBELL.

(PLATE CXLVI.)

Pilularia Americana is by no means uncommon in California, and is said to be especially abundant in the Sacramento Valley. Last spring a quantity of fresh specimens, collected near Suisun, were sent me by Mrs. Brandegee, and as they bore numerous sporocarps, in all stages of developyment, it seemed a good opportunity to attempt to clear up some obscure points in the early development of the sporocarps of the Marsiliaceæ.

Without microtome sections, it is quite impossible to study the earliest stages satisfactorily on account of their small size, and because they are completely buried in a mass of hairs that cover the growing point of the stem, and all of the younger parts in its vicinity. Those hairs cannot be removed from the young sporocarp and interfere very seriously with a clear view of it.

Our knowledge of the development of the sporocarp of *Pilularia* is based mainly upon the work of Sachs,* Goebel,† and Juranyi,‡ and that of *Marsilia* upon Russow's investigations.§ The origin of the sporocarp itself, however, and the formation of the cavities in which the sporangia are borne, was not clearly understood.

By imbedding in paraffine in the usual way and sectioning with a microtome, no trouble was experienced in getting a complete series of preparations that showed all the details, and the results of a study of these is here given. In preparing the specimens for sectioning, the growing tips of the fruiting plants were treated for two or three hours with a 1 per cent. aqueous solution of chromic acid, washed, stained *in toto* with alum cochineal, and after sectioning, stained on the slide with alcoholic Bismarck-brown; my usual method of preparing sections of young tissues.

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*Sachs, Text-Book of Botany, 2 ed., pp. 455–460.

† Goebel, "Outlines," p. 240, foot note.

‡ Jurányi. The original paper in Hungarian. Reported in Just's Jahresbericht, Jahrgang 1879, p. 416.

§ Russow. Histologie und Entwickelungsgeschichte der Sporenfrucht von Marilia. Dorpat, 1871.

The creeping stem of *Pilularia* grows from a single tetrahedral apical cell, from which three series of segments are cut off, as in most ferns. Two of these series give rise to the two rows of leaves, and from the third, roots only are formed. The stem branches freely, the branches arising close behind its apex.

Leaves of two kinds are formed, fertile and sterile; the former differ from the latter simply in bearing a sporocarp. The foliar nature of the sporocarp has been inferred from analogy with the ferns, and also from a study of the position of the older sporocarps but the way in which it originates from the leaf was not known. Juranyi * states that in *P. globulifera*, the formation of the fruit begins, only after the leaf has reached a considerable size. My own observations on *P. Americana* do not confirm this. On the contrary, the yonng fruit begins to develop almost as soon as the leaf can be recognized, and while it is still close to the apex of the stem, long before it is large enough to be seen with the naked eye.

The young leaf, like the stem, grows from a tetrahedral apical cell. Growth at first is stronger upon the outer side, and in consequence, even at a very early stage, the leaf is strongly coiled, as in all the homosporous Leptosporangiates. In the fertile leaves, however, before this curvature has become very pronounced, a protuberance may be noticed upon its inner face, not far above the base. (Fig. 1, M.) This originates from the growth of a single cell (x), which acts as an apical cell in the same way as that of the apex of the body of the leaf. This protuberance is the young sporocarp which at this stage is clearly seen to be simply a segment or branch of the fertile leaf.

The young sporocarp enlarges rapidly after its formation and assumes the form of a blunt cone. Next, on the side turned toward the sterile segment of the leaf which bears it, a slight prominence is noticed (Fig. 2, F.), and about the same time two similar lateral prominences are formed. As in the sterile segment growth is stronger on one side (here the side turned away from the sterile segment), and in consequence the sporocarp bends over toward the sterile segment of the leaf. The apex of the young sporocarp (Fig. 2, F.), together with the three prominences referred to, enclose a slightly depressed area which is top of the young sporo-

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* L. c.

carp. The four prominences (including the original apex of the fertile segment), are beyond doubt to be regarded as leaflets, which, however, are never much elevated above the surface of the young fruit, and in this first stage form four slightly elevated ridges.

A little later (Fig. 3), these become more prominent, and a slight depression or pit is formed between the base of each and the cells occupying the top of the young sporocarp. These pits are separated laterally by the coherent margins of the leaflets which extend to the axis of the sporocarp and are continuous with it. The young fruit now enlarges rapidly, and as it does so the depressions deepen owing to the elongation of the leaflets, and also to that of the cells of the axis of the sporocarp, which form a sort of columella running through the center.

The leaflets, or as we will now call them, lobes, are only free at their tips; and as the edges are in contact from the first and extend to the axis, the clefts between them and the axis form four deep cavities that open by as many pores at points opposite the tips of the lobes. These pits correspond to the "canals" described by Russow in the fruit of Marsilia.

Juranyi states that these cavities are caused by a splitting apart of the cells of the inner tissue of the sporocarp, and that the communication with the outside is brought about by the subsequent separation of the cells at the apex of the sporocarp; that is, that the cavities are endogenous in origin. Doubt has been expressed as to the accuracy of these statements, and Goebel states that his observations do not bear them out.

A study of longitudinal sections of the young sporocarp show beyond doubt the strictly external origin of these cavities.

Up to the time that the cavities begin to form, the young fruit is composed of a uniform, small-celled parenchyma, but a little later, however, the primary tissue systems are differentiated, and the separation of the body of the sporocarp from its peduncle becomes evident. About the same time the axial cells in the basal part of the sporocarp extending into the peduncle, elongate and form the beginning of the single fibro-vascular bundle that traverses the peduncle and joins that of the sterile segment of the leaf near its base.

The peduncle grows rapidly and becomes several times longer than the sporocarp itself—(Fig 5). The growth upon the upper side of the latter is stronger than upon the lower side, and in consequnce, it becomes bent over, nearly or quite at right angles to the peduncle. With the enlargement of the sporocarp the cavities within become deeper and wider in a direction parallel to the broad surfaces of the lobes; but the radial growth of these keeps pace with the longitudinal growth, so that the space between the inner surface of the lobe and the columella, is very narrow. The growth is especially active in the inner epidermal cells, which project more or less and form a cushion running vertically along the median line of each lobe. This cushion is the sorus (Fig. 5. 6. 8.), and as its surface cells develop into the sporangia, it nearly fills the cavity in which it lies. A tranverse section at this time shows that the portions separating the cavities are composed of about four layers of cells.

The fibro-vascular bundle which traverses the center of the peduncle divides into four branches at the base of the sporocarp, and one of these goes to each lobe and forms a sort of midrib (Fig. 6.). Later each of these bundles sends off two lateral branches that follow the margins of the lobe. A cross section of a sporocarp at this stage (see Fig. 9), shows these as groups of small cells at nearly equal distances from each other, one at the center of the lobe, the others close to its margin. By this time the epidermal cells of the outside of the sporocarp begin to thicken. This is the first indication of the hard shell found in the ripe fruit.

While these changes are going on in the outer tissues of the sporocarp, the sporangia have begun to develop from the surface cells of the sori. Active growth begins in these cells, which become elevated as papillæ above the surface of the sorus. This is most marked in the basal or older cells, but proceeds rapidly toward the upper end of the sorus. While in a general way we may say that the sporangia arise in acropetal succession, still new ones arise later among the earlier formed ones, without reference to their position; indeed all of the surface cells of the sori may be regarded as potentially, at least, sporangium mother-cells.

There is a good deal of variation in *Pilularia*, as in many ferns, as to the direction of the first division walls in the young sporangium, and it seems to me that too much stress has been laid upon this by some writers.

In the earlier sporangia the first division walls are usually strongly oblique, but even here the first wall may be transverse (see Fig. 7, a.), as usually happens in the Polypodiaceæ. Several oblique walls now arise which meet each other in such a way that the terminal cell has much the form of an ordinary tetrahedral apical cell. Soon, however, a wall is formed parallel to the outer wall of the terminal cell, and thus an inner cell (Fig. 7, c.), the archesporium, is cut off. The archesporium is formed relatively earlier in the first formed sporangia which are almost sessile, while in the later ones, where they are more crowded, the pedicel is much better developed (Fig. 10).

From the archesporium the tapetal cells (t.), are cut off in the usual way, and subsequently these divide by both radial and tangential walls into a large number of cells. For the most part there is but one set of tangential divisions, but sometimes there is a second one in some of the cells, so that at these points the tapetum is three cells thick.

The central cell divides by an oblique wall into two cells and these each divide twice more, and sometimes some or all of the resulting cells may divide again, so that the whole number of the resulting spore mother-cells ranges from eight to sixteen.

When the full number is complete the cells separate owing to the partial disintegration of the division walls, and, at the same time, the walls of the tapetal cells become completely absorbed and their contents form a mass of protoplasm in which the separated spore mother-cells are imbedded. These now increase somewhat in size and become globular as the pressure of the surrounding cells is removed. The sporangium has now increased a good deal in size and the spore mother-cells do not completely fill it.

In fresh sporangia the tapetal cells appear completely disorganized, but when stained sections are examined it is evident enough that the protoplasm and nuclei of the cells persist unchanged, and the further development shows that the protoplasm and nuclei of the tapetum probably play an important part in the further growth of the spores.

The division of each of the spore mother-cells into four shows nothing peculiar. The nucleus divides twice before any division of the protoplasm takes place, and the four daughter-nuclei arrange themselves at equal distances from each other near the periphery of the cell, after which division walls are formed simultaneously between them, and the resulting spores are of the tetrahedral type.

Up to this point the sporangia are all alike, but now a difference is noticed between those in the lower and those in the upper part of the sporocarp. The former develops into macrosporangia, the latter into microsporangia. In the latter all of the young spores come to maturity, but in the former one spore very early begins to grow faster than the others, which finally shrivel up and develop no further. The young macrospore is at first nearly globular, but soon becomes oval, and finally completely fills the sporangium. In its early stages the membrane is thin, but as it grows it becomes very thick. A slight examination shows that the spore is surrounded by a layer of protoplasm, in which are imbedded a great many nuclei. This protoplasm is no doubt that derived from the tapetum, and its position indicates that it, with its included nuclei, is actively concerned in the nourishment of the growing macrospore. This office is probably two-fold; first to provide material or the growth of the spore contents, and secondly to deposit upon the outside of the spore the material for the formation of the peculiar and highly specialized spore coat, characteristic of the Marsiliaceæ. The development of the spore membrane seems to be the same in the microspores, but owing to their smaller size is not so easy to trace out. The wall of the sporangium remains but one cell thick, and shows no traces of the annulus found in all the terrestrial leptosporangiate ferns. This complete disappearance is in allprobability to be traced to a loss of function. In the terrestrial ferns, the opening of the sporangium is brought about by drying up, and the contraction of the annulus by drying is the principal factor in the process. In the Marsiliaceæ, on the contrary, the sporangium only opens when its walls are dissolved by the action of water. Possibly further search will show some trace of an annulus in the earlier stages of the sporangium, but I could discover none, either in the young or ripe sporangia.

As the sporocarp ripens the outer cells become very hard, especially the first layer of hypodermal cells (Fig. 12, b.), whose walls become finally so much thickened that the cell cavities are almost completely obliterated. The second hypodermal layer also has its walls more or less thickened, but not nearly to the same extent.

The ripe sporocarp is about 3 mm. in diameter, and the peduncle about as long and bent downward, so that the sporocarp is partially or completely buried in the earth. When perfectly ripe it splits into four valves corresponding to the lobes or leaflets of which it is made up. This splitting follows the median line of the partitions in the sporocarp.

A comparison of the foregoing statements with the corresponding points in the development of *Marsilia*, so far as the latter is known, show, as might be expected, close resemblances. There seems no doubt that the sporocarp is simply a portion of a leaf, bearing much the same relation to the sterile part that the fertile pinnæ of *Ophioglossum* or *Osmunda* for example, do the sterile part of the leaf. We may perhaps more aptly compare it to such a fern as Onoclea, which is really more nearly related. The structure of one of the spore-bearing leaf segments of *O. sensibilis* for instance, is very similar, indeed, to the sporocarp of *Pilularia*, except that the sporangia are borne upon the lower and not upon the upper side of the leaf. As the Marsiliaceæ are in all probability descendants of forms related to the Polypodiaceæ, the origin of these peculiar points is probably to be looked for in forms having fertile leaves of a type similar to *Onoclea*.

On comparing *Pilularia Americana* with *P. globulifera*, of Europe, less difference was found than is generally supposed.* Except the longer peduncle of the fruit of the former and a slightly diminished development of the wall of the macrospore, I could see no difference. In size my specimens were little, if any, inferior to specimens of *P. globulifera* studied by me in Europe, either as regards the leaves or the sporocarp; and, almost without exception, the sporocarp was four-chambered as in that species, instead of three-chambered as described in the text-books. The absence of a well marked constriction in the macrospore is due simply to a slightly diminished development of the outer layers of the spore-wall in the upper part of the spore, and a trace of this can always be found in the older spores. At any rate the two species must be regarded as very closely related.

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* Goebel, L. c., p. 240. Underwood, "Our Native Ferns and Their Allies," 3d. ed., pp. 126–127. Watson, "Botany of California," Vol. ii., p. 352.

Explanation of Plate CXLVI.

The magnification is indicated before each figure.

Fig. 1. The base of a very young fertile leaf of *Pilularia Americana*, showing the beginning of the sporocarp, m. its apical cell.

Fig. 2. Longitudinal section of an older sporocarp—F. F. two of the young lobes.

Fig. 3. A similar section of a somewhat older sporocarp.

Fig. 4. A still older sporocarp, in which the cavities are well developed.

Fig. 5. Longitudinal section of on older sporocarp, including the peduncle. S. S. sori; H. hairs; fb. fibro-vascular bundle of the peduncle.

Fig. 6. Longitudinal section of about the same age as in Fig. 5, but at right angles to the peduncle.

Fig. 7. Longitudinal section of the young sorus, a. b. c. young sporangia.

Fig. 8. Transverse section of an older sporocarp, showing the four cavities.

Fig. 9. A single cavity from a somewhat younger one.

Figs. 10, 11. Young sporangia, t. the tapetum.

Fig. 12. Part of the wall of a nearly full grown sporocarp, a. b. c. the outer thick-walled cells.

Free Nitrogen Assimilation by Plants.

By H. W. Conn.

The study of bacteriology has introduced to us an entirely new realm of knowledge. Twenty-five years ago the scientific world had little conception of the great change that was to be made in our knowledge of the processes of nature by the development of the study of micro-organisms. That bacteria were the cause of certain diseases was even then strongly believed by many and had been definitely proved in a few cases. But that micro-organisms, in general, lay at the foundation of many of the most important physiological processes of nature was not even dreamed of. The difficulty of research in this line made it possible for only a very few to accomplish anything. About ten years ago Robert Koch invented a method of obtaining pure cultures which has placed this line of investigation within the reach of all. The simplification of the methods of obtaining pure cultures has produced an immense stimulus in this branch of study and has turned hundreds of observers towards investigation in this direction. The study of the last ten years has been modifying our ideas with marvelous rapidity. That bacteria produce disease is demonstrated beyond question, but we are beginning to realize that this is only a small part of the purposes they fulfill. We are learning that it is to the action of these organisms that many of the normal processes in nature are due, and that it is to their agency that the growth of plant life of the higher orders is largely indebted. One of the most recent and most surprising discoveries has been the relation of bacteria to the process of nitrogen assimilation.

It is well known to all botanists that nitrogen is an absolutely necessary food for plants and animals. It is known further that the animal kingdom obtains all of its nitrogen from plants, and that plants obtain their nitrogen from the soil in the form of certain salts, the chief of which are nitrates. Now, it is an undoubted fact, that the nitrogen factor of the soil upon which plants can depend, is little by little becoming exhausted through various agencies. In the first place, all of the nitrogenous parts of plants which are used by man as food, find their way eventually into the sewage, thence to the river, and finally to the ocean; and once reaching the ocean, the nitrogen is lost, so far as the terrestrial vegetation is concerned. Moreover, it has been shown that the various processes of putrefaction are slowly turning the complex nitrogen compounds into simpler ones, and eventually eliminating the nitrogen into the air in a free form. Inasmuch as all organic compounds, animal and vegetable alike, are subject to these putrefactive agencies, it is evident that a large amount of the nitrogen factor of the soil must, in this way, pass out into the air as free nitrogen. The extent of this loss is unknown, but it is doubtless considerable. Plainly, unless there is some way of getting the nitrogen back from the air to the soil again, the soil is doomed to exhaustion. But it has seemed to be the result of many experiments that plants in their ordinary vegetation are capable of obtaining nitrogen from the soil alone, and are unable to use the free nitrogen of the atmosphere. Putting all of these facts together, it has seemed to science that the nitrogen store upon which plants can draw is being used up and must be sometime exhausted, thus putting an end to vegetation.

Practically our agriculturists have for some time experienced the difficulties arising from this source. Many soils under long cultivation have become largely exhausted of their nitrogen supply, and the farmer appreciates more and more the necessity of nitrogen fertilizers. These are now brought from long distances. The nitrate beds of Chili and the guano beds of the South Pacific are the chief stores from which this valued food is obtained. But even the nitrogen beds have their limits, and as the need for nitrogen on our cultivated soils becomes greater through exhaustion, the price of nitrogen must become greater also. One writer has said that the explosion of powder in a gun does more injury than the bullet. The latter only kills a man, the former aids in in using up the nitrogen store which cannot be replaced and is a lasting injury to mankind. It is very plain from all of this that there is a great need for some means of obtaining nitrogen for our soils besides the store of nitrates in our nitrate beds. Curiously enough, the bacteriologists are to-day pointing out the method by which this problem can be solved.

As mentioned above, it was the conclusion of many experiments that the higher plants cannot make use of free nitrogen from the air. Up to 1880 all experiments seemed to point to the same direction. At about that period, however, experiments with certain of the legumes began to show an increase in the nitrogen in plants beyond that which was fed to them in their food. The experiments were at first rather indefinite and strongly denied, but as the decade from 1880 to 1890 passed they became more numerous and conclusive until, finally, it was a definitely established fact that many of the legumes can in some way obtain nitrogen from some source besides the soil. In 1888 Hellriegel and Wilfarth, in a series of careful experiments upon the subject, studied the relation of this nitrogen assimilation to the production of tubercles upon the roots of plants. Pea plants and other legumes have been for a long time known to develop small nodules on their roots, and experiments of Hellriegel and others showed a parallel between the development of these root tubercles and the power of obtaining nitrogen in large quantities. It was Hellriegel, also, who first demonstrated that these root tubercles were abnormal products on the roots of the pea, produced there by certain organisms in the soil. Hellriegel found, for instance, that peas growing in sterilized soil produced no tubercles and fixed no nitrogen, while peas growing in a similar sterilized soil but watered with water in which ordinary soil had been standing for awhile (soil infusion), did develop tubercles and fixed nitrogen. The same soil infusion when sterilized was not able to cause the production of tubercles. From all of this it was evident that the tubercles were produced upon the roots of the peas through the agency of some of the organisms in the soil.

A microscopic study of these root tubercles soon attested the same conclusion. It was found that the tuberacles were filled with small organisms related to bacteria, and that the development of the tubercles was parallel to the developement of these organisms. The organisms are somewhat different from normal bacteria and have been called bacteroids.

According to the investigations of Prazmowski in 1890, the development and growth of the tubercles are as follows: *Bacterium radiciola* lives normally in the earth and collects in numbers on the outside of the roots of various legumes. Some of the organisms succeed in forcing their way into the tissues of the young roots, though they are not able to pierce the older roots. For a while they may remain in the root as free bacteria, but the plant plasma seems to exert an injurious influence upon them, for very soon a thin membrane is formed around the bacteria masses, inclosing them like a pouch. Prazmowski thinks that this membrane is a product of the bacteria themselves, formed for the purpose of protecting them from the injurious action of the plant tissue. The bacteria, which do not succeed in getting into one of these pouches, soon cease to grow and degenerate into irregular forms called bacteroids. The bulk of the bacteria, however, become inclosed in the membrane, after which they continue their growth with much vigor. The pouches begin to grow in thread-like masses, and these make their way among the cells of the root.

The thread branches more or less as it lengthens, and its various filiments grow through and between the cells, soon permeating the root with a fine, branching filament, which looks much like the mycelium of a mould. This bacteria pouch has been regarded as the hypha of some low fungus, but instead of being a mycelium growth of a mould the thread is nothing more than a large branching colony of bacteria enclosed in a thin membrane.

The growth of this colony of bacteria among the cells of the root stimulates these cells to an unusual growth. They multiply more rapidly than usual, and thus soon produce a swelling on the root which is the beginning of the tubercle. While this rapid multiplication of root cells is going on, the bacteria pouch continues to grow and swells out into rounded vesicles within the cells which lie at the center of the forming tubercle, until most of them become filled with these expanded portions of the bacteria thread. Meantime the root cells of the plant have been rapidly growing, and form around the cells containing the bacteria, several layers of smaller cells, which develop into a hard, corky covering, forming a coat around the tubercle. This seems to be impervious to the bacteria thread, and confines the bacteria within its limits.

The bacteria colony now undergoes a change. Although Prazmowski has not been able to follow the details of the process, it is thought that the vesicles in the central cells swell until the membrane covering the bacteria is so thin that it bursts, and the bacteria are themselves extruded into the plasma of the root cells. At all events the vesicles disappear and there appears in their place what is called the bacteroid tissue. His interpretation is that the vesicles burst, and the bacteria coming into the cell plasma are immediately checked in their growth by the injurious influence of this plasma and begin to undergo involution changes. Instead of multiplying in the normal manner, they assume various abnormal forms which have no further power of growth. They become, in short, the bacteroids which have been found by many observers, filling the central cells of the tubercle. The bacteria retain their power of growth only so long as they remain in the protecting covering of the membrane.

The tubercle by this time is pretty well formed. The outer cells have undergone quite an extended growth and differentiation, so that the tubercle is really a structure of a rather high grade of plant tissue. The tubercle itself is thus really a growth of the root cells of the plant and not a growth of bacteria. In the center of this mass of plant tissue are a large number of cells which are completely filled with the so-called bacteroids. These bacteroids give to the tubercle at this stage a flesh-red color. Some of these central cells are so completely filled with them that nothing else can be seen, while others may still show the cell nucleus. In others spaces begin to appear in the body of the cell. The appearance of the spaces marks a new stage in the history of the tubercle and indicates that the bacteroids are beginning to be absorbed by the plant. The cell plasma soon assumes a network structure, and from this time the bacteroids entirely cease their activities and begin to disappear rapidly. After a little they are completely absorbed by the substance of the plant, and the tubercles are left as empty pouches. The tubercles have now changed their appearance again and assume a somewhat grayish green color.

This practically ends the history of the tubercle. In most cases some of the bacteria seem to remain within their original membrane and, therefore, are still capable of growing. These may or may not set up a secondary growth, but it amounts to little, for by this time time the plant has usually blossomed, ripened its seeds, and the root is beginning to die. The tubercle is immediately attacked by the putrefactive bacteria in the soil and becomes decomposed.

Since the work of Prazmowski other observers have studied the same problem. Pure cultures of the root organism have been obtained and used by artificial inoculation. Water cultures have been made where the process can be better studied. The general result has confirmed the idea above outlined, and proved conclusively that the tubercles are the result of the action of micro-organisms in the soil.

There has been more or less dispute in regard to the actual nature of these organisms. For a time they were thought to be parts of the roots of the legumes, but this idea was soon abandoned, and they were regarded as the hyphæ of moulds. Later their relation to bacteria was rendered extremely probable, and this is the generally accepted view to-day. The organisms do not act like ordinary bacteria, since they grow in a different way and have a somewhat different form. It is a matter of comparatively little importance, however, whether the organisms are regarded as true bacteria or simply as related organisms. The significant fact is that they are colorless microscopic organisms, living in the soil, belonging to the low fungi and having the remarkable functions above pointed out.

The work of the last two years has shown further that there are a number of different species of these root organisms and that different species of legumes are associated with different species of these bacteroids. The organism which produces the root tubercles of the lupine will not produce the root tubercle of the pea, and, although the subject has not been as yet very thoroughly cleared up or studied very widely, it seems that nearly all of the different species of legumes are associated with different forms of organisms in the soil. It has followed from this that special soils are especially adapted for the growth of certain species of legumes. A soil for instance in which the lupine has been growing is much better adapted for the production of tubercles on lupine roots than it is for the production of tubercles on the roots of the pea, simply because the soil is already filled with the organisms which can grow in the lupine and not yet provided with that growing in the pea. It requires thus a culture of a year or two to develop in the soil a sufficient quantity of the appropriate species of bacteria to render the growth of any species of legume especially advantageous. The special work of bacteriologists at the present time is turned largely in the direction of determining the facts in regard to this matter of bacteria species associated with the different species of legumes.

It is plain from the above that the production of root tubercles is not a normal feature of the life of the pea plant, and that the bacteria have some peculiar relation to the higher organism. It is, however, hardly proper to regard their relation as that of a parasite and its host. It is true that the bacteria grow in the root of the legume and doubtless obtain sustenance therefrom, but the higher organism does not suffer from the parasitism and the relation of the two organisms is rather that which is known as symbiosis, i. e., a relation in which each organism gains advantage. So far as the bacteria are concerned, they doubtless gain a place for developing a breeding pouch, and perhaps gain some sustenance from the root of the pea. So far as the pea plant is concerned, the presence of the organism makes possible the assimilation of free nitrogen. In all of the experiments which have been carried on it has been found that the production of the tubercles is necessary to enable the legumes to assimilate nitrogen. Where the legumes develop without tabercles on account of the lack of bacteria in the soil, no nitrogen was assimilated, and where the tubercles were very abundant, much nitrogen was taken from the air. It is plain then that the pea plant obtains a considerable advantage from its association with the lower organism.

As to the method by means of which this association of organisms extracts the free nitrogen from the air, we are as yet in the dark. That it is free nitrogen that is assimilated by the plant and not combined nitrogen, has been demonstrated by the experiments of the last two years, but where the nitrogen is first fixed is as yet a question. It has been suggested that the bacteria themselves take the nitrogen out of the air and store it up in these tubercles; it has been suggested that the bacteria stimulate the legumes in such a way as to enable the legume to seize the free nitrogen from the air and store it in the roots; and it has been suggested that the assimilation of the nitrogen is a matter of the combined action of the bacteria and the legume life together. Which of these possibilities is the proper one science has not yet indicated, but it has been satisfactorily proved that through the combined life of the bacteria in the root of the pea plant nitrogen is taken from the air and stored up in the roots of the pea plant in the form of nitrogen compounds of high complexity.

The work on this subject of nitrogen assimilation at the outset seemed to indicate that the family of legumes alone possess the power of absorbing nitrogen from the air. Undoubtedly, this family possesses this power to a greater extent than any other family of plants, but it is still a question whether the same power is not developed in certain other plants. Upon this matter experimenters are not in agreement at the present time, for while some experiments have plainly pointed to a nitrogen assimilation of non legumes, the results are somewhat indefinite, and it is difficult at present to determine the truth. Be this as it may, the fact still remains that it is to legumes chiefly that we must look for the restocking of our soils with nitrogen.

It has been a difficult matter to make any very valuable quantitative tests upon this power of bacteria and legumes to assimilate nitrogen from the air. Still, within the last year or two quite a number of extended experiments have been turned in this direction. Experiments have shown in the first place, that in regard to some of the legumes at least, a greater amount of nitrogen can be assimilated through the agency of the bacteria alone than can be assimilated by the same plants if they are fed with nitrogen foods. The same species of legumes are grown under two conditions, in both cases supplied with the organism which produces its root tubercles, and in the one experiment fed with nitrogen foods in the form of nitrates, and in the other not thus fed. The result shows a considerable difference to the advantage of the plants that are not fed with nitrates. The amount of nitrogen which can be assimilated and fixed in the soil by these legumes is really very great. In experiments with scarlet clover it has been found that a plant will assimilate from the air more than twelve times the amount of nitrogen in the seed. In one of the most recent experiments it has been found that by the use of beans a single crop assimilates and fixes in the soil 225 pounds of nitrogen per acre, equivalent to about 1400 pounds of nitrate of soda. These figures are very striking and suggestive, and they show plainly what a very great agent in the fixation of nitrogen the legume plants can become when properly associated with their appropriate species of bacteria. Peas, beans, cow peas, alfalfa, vetch and clover appear thus far to be the most valuable plants for this purpose, but other legumes serve the same purpose.

These experiments promise to be of the most incalulable value to the agriculturist and to the agricltural interests of the world in the future. They offer to our farmers a means of getting nitrogen without going to the expense of buying it, of enriching their soil by simply cultivating upon it plants which experiment has shown most appropriate to the soils in question. They emphasize the value of clover as a crop to precede wheat, and explain the great nutritive value of clover hay. Indeed, bacteriologists are now beginning to wonder if it has not been through the agency of these micro-organisms that the large nitrate beds of the world have been deposited. The nitrate beds of Chili are vast in extent, and it has been already suggested that these beds owe their deposition to the agency of some microbes, to bacteria associated with higher plants which have grown in these localities in past ages. If so, we see even more forcibly that at the very foundation the life of the world is dependent on the action of bacteria.

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On the Casting-off of the Tips of Branches of Certain Trees.—Part II.

BY AUG. F. FOERSTE.

(PLATES CXLVII. AND CXLVIII.)

In "Gray's Structural and Systematic Botany," page 44, may be found the following passage:

"When a terminal bud is formed* this is commonly the strongest or among the stronger. But in many cases it habitually or commonly *fails to appear.*† In the Elm the bud axillary to the last leaf of the season takes its place. In the common Lilac a pair of buds, which were in the axils of the uppermost of the opposite leaves, seem to replace the terminal bud, which *seldom*† develops."

On page 49 are the following words:

"In other cases, on the contrary, the branches grow on *indefinitely* until arrested by the cold of autumn; . . . the later-formed upper portion most commonly perishing from the apex downward for a certain length *in the winter.*† The Rose and Raspberry, and, among trees, the *Sumac* and *Honey-Locust*, are *good illustrations of this sort.*"†

In the September (1892) number of this journal the writer had occasion to show that the reason why the terminal bud *fails to*

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* Incidentally the author is chiefly referring to the scaly buds of ligneous plants.

† Not italicized in the original.

appear in some ligneous plants was because at an earlier date, before terminal scaly buds were formed, the tips of the branches had fallen off at well marked joints. This was shown to be the case not only in the Elm, but also in other species.

In the common Lilac the terminal scaly buds fail to appear, simply on account of the fact that at an early date the tips of the branches wither, though remaining more or less attached to the stem.

As regards the perishing from the apex downward for a certain length *in winter,* this is no doubt true of the Rose and the Raspberry; but in the case of the Sumac and Honey Locust it just as certainly is false, since in the case of both these plants the tips of the branches are cast off at well marked joints before the close of summer, as will be seen in the following paragraphs.

The preceding passages have not been quoted in a spirit of criticism, but in order to show that the subject of the casting-off of the tips of branches, although a common occurrence, has not yet received all the attention it deserves.

In the présent paper it is desired to emphasize two facts, that this casting-off of tips occurs in widely different families, and that in certain minor groups of plants, or sections of families, the habit is common to many species, while in other groups scaly terminal buds are the rule. It is believed that the presence or absence of terminal scars on winter twigs has additional interest, since their existence may assist greatly in the determination of trees in winter, as suggested by the writer in another paper recently.

In the following notes, unless otherwise specified, the observations refer to plants growing in the vicinity of Dayton, O., the examinations and figures were all made during the first week of August.

Tīlia Americana (Fig. 5). See, also, Fig. 6, Plate CXXXII., of this journal, showing the same species during its winter months. Fig. 7 of the same plate shows one of the very few tips of *Tilia platyphyllos*, still remaining attached to its branch during the last days of May, at Heidelberg, Germany.

Ptēlea trifoliata (Fig. 20). The petioles are light green, the bark of the twigs is of an almost chocolate brown color. The terminal scar is roundly angulate, similar to that of *Rhus glabra* and *Gymnocladus dioica*. *Xanthoxylum Americanum* has terminal buds rising but little above the surface of the stem, and covered with a thick coating of short red hairs.

Ailanthus glandulosus was figured (Fig. 5) on Plate CXXXII. of this journal.

Ampelopsis quinquefolia (Fig. 26). This plant is a curious case of sympodial growth. After a node bearing a leaf but no tendril, there are quite normally two nodes bearing a leaf and also a tendril, then follows a node again without a tendril. The leaves have the appearance of being alternate, distichous. Where there is no tendril the leaf axil quite commonly contains a well developed scaly bud. Now it was a curious fact in all the observed cases that where the tips of the branches were absent, the scar belonged to that node where there should be no tendril. This is well worthy of note since in August many of the tendrils of this plant have fallen off and left scars, though these are much smaller than the terminal scars. In case of the grape it was very difficult to get satisfactory tips of branches, since these tips were still growing, or had been eaten off by animals. In a very few cases I noticed, as in *Ampelopsis*, a scar where the node should bear no tendril, and I have figured one of these (Fig. 24). *Celastrus scandens* in September showed terminal scars only on the shorter, stronger branches, but later, in November, almost all branches showed terminal scars.

Æsculus glabra (Fig. 14) and *Æsculus Hippocastanum* (Fig. 4 of Plate CXXXII.), will be discussed at the close of this paper. *Staphylea trifolia* (Fig 12, see also Fig. 3 of Plate CXXXII. of this journal), has a very peculiar terminal scar, owing to the fact that the uppermost pair of buds have so compressed the sides of the terminal scar as to very much decrease its diameter in one direction and to give it the form noticed in the figure. The central portion is depressed. The figure shows the stipules. Species of *Negundo* and *Acer* have terminal scaly buds.

Rhus glabra, (Fig. 21) has a roundly-angulate terminal scar. The fruited tips of this species remain on the plant all winter, dying back as far as the first leaf bud, as may be expected in the case of any fruited tip of a stem, which did not fall off after the seeds were ripened (as is usually the case). All branches not terminated with flower clusters, cast off their tips at well marked scars. *Rhus copallina* sheds a tip about 15 mm. long, consisting of three or four leaves with very hairy, strong petioles and very small and narrow, almost needle-like leaflets, 3–4 mm. long. *Rhus aromatica* (Fig. 18) casts off its leaves at a point a little above the base of the petiole; the portion remaining attached to the stem is rather appressed, and hides the subtended bud during its earlier development. The terminal scar is found at the end of a round, rod-like tip, which may be produced quite a distance beyond the point of attachment of the uppermost remaining leaf. *Rhus radicans* has terminal scaly buds.

Robinia Pseudacacia (Fig. 3). The terminal scar is somewhat irregular, owing to the angulate character of the branches. In consequence of shrinking, subsequent to the falling off of the tip, the terminal scar is quite puckered up, as is also the case with *Gleditschia triacanthos*. The figure shows the top of the branch still attached, but withering, and the position of the scar is already indicated by the fact that the yellow color of the withering part stops abruptly at a plane bounding the green portion further down which is to remain. Even before the slightest withering has commenced, it is already possible to see at what node the plane of separation is to be by the fact that whereas the last leaf of the remaining portion develops rapidly into a full sized leaf, the next succeeding leaf which is to fall off shows retarded growth at a very early stage, while the tip is still green.

During the first week of August all the tips of the higher branches had fallen off. This was true also of the lower branches, where the tree was fully developed. Occasionally, however, the lower branches were more vigorous, and were still continuing growth, or were preparing to also cast off their tips. From one of these lower branches the figure was taken. In young growth, or in fresh shoots from cut down stumps, the tips of the branches were often present in the middle of August, but in the middle of September all the tips seemed to be shed. In the axils of the leaves are little raised circular scars, left by axillary buds which are cast off at a very early stage of their development. In the figure these are shown in all except the lowest axil. In very vigorous shoots these buds develop into leafy branches during the same season. It is especially to be noted that the lower branches of a tree are often still growing after the tips of all the upper branches have been cast off. *Gleditschia triacanthos* (Fig. 6) shows all the features just noted of *Robinia* The only bud which is visible in the axil of the leaves is extra-axillary, being situated a short distance above the axil. This bud is cast off as a rule, at an early stage, or on very vigorous branches, develops into a leafy branch during the same season. The extra-axillary compound thorn of this tree is morphologically equivalent to these buds. As a rule the thorns are developed chiefly along the middle portion of each year's growth, but occasionally the thorns occur even at the uppermost axils destined to remain. In that case the terminal scar is formed just above the last thorn. The visible buds therefore, of both *Robinia* and *Gleditschia*, (unless they be represented by thorns or develop into leaf branches the same season) are cast off. The buds which continue the growth of the branch are hidden away beneath the petioles of the leaves at this time of the year, so that the cast off buds are in reality the uppermost ones of a series of a superposed bud. *Gymnocladus dioica*, (Fig. 7) has a roundly angulate terminal scar. The superposed buds are sunken in pits, and often drop out. This is especially true of the largest bud in the axil of the last remaining leaf, this bud being the uppermost one of its series, and hence, lying next to the terminal scar. *Cercis Canadensis*, (Fig. 2) has a little rounded terminal scar. The last remaining leaf has a petiole placing itself in line with the stem, as is quite commonly the case where the phyllotaxy is alternate and distichous. A glance at the figures on the accompanying plates will readily show this. It is not uncommon to find more than one bud even in the last remaining axil, and the larger of these superposed buds, the upper one of the series, lies then against the terminal scar.

Prunus Americana (Fig. 19) shows very distinct terminal scars. It is more usual for ligneous Rosaceæ to have terminal scaly buds, so the present exception is worth noting.

Calycanthus floridus (Fig. 25) has well marked terminal scars.

It was impossible to determine satisfactorily whether *Sambucus Canadensis* ever had terminal scars or not. In the early days of August many branches were still growing. Later in the year some branches were found terminated by scars, but these seemed to be caused by the breaking off of the fruited flower clusters at the ends of the branches. *Lonicera flava* (Fig. 22) has the tips withering away, but not falling off at a well marked scar. The dried up tips may be seen between the upper pair of leaf buds.

Cephalanthus occidentalis has its branches almost invariably terminated by inflorescences, a part of which have never developed into flowers. The few tips with flower buds show shriveled-up leaves at the ends of stems, drying back a little, thus giving rise to sympodial growth.

Catalpa speciosa, Warder, was figured (Figs. 1, 2) on Plate CXXXII. of this journal. During the early days of August most of the tips had been cast off; here and there the very short, shriveled remains embracing only a few nodes were still attached to the stem. The tips of a few of the lower branches were growing vigorously and did not lose their tips until later during the month. It was impossible to get satisfactory specimens from *Tecoma radicans.* Many branches were still growing when examined. Where there were terminal scars it was often possible to ascribe these to the falling of the flower clusters, where fruiting had not set in. One case was found where apparently the leafy tips of a branch had fallen off, but the case was not altogether satisfactory.

Diospyros Virginiana, with its shriveled-up tip, was figured (Fig. 9) on Plate CXXXII. of this journal. Terminal scars are also common.

Ulmus Americana (Fig. 10 and Fig. 8 of Plate CXXXII. of this journal) and Ulmus fulva (Fig. 8) both lose the tips of their branches, indeed, quite early in the year. *Ulmus campestris* was observed at Heidelberg, Germany, to have lost about one-third of its tips during the last week of May, although the future plane of separation was becoming visible in the remainder. *Celtis occidentalis* (Fig. 11) also shows the terminal scar. A little feature was noted which will well serve to readily distinguish this tree in winter time, when other aids are not at hand. The scaly bud in the axil of the last remaining leaf is quite strongly bent away from its leaf and recurved over the terminal scar, the bud itself giving evidence of this curvature. The appressed nature of the remaining buds is also worthy of note.

It has already been remarked here several times that the lower branches of trees seem to be more vigorous and frequently are still growing when all the upper branches have already cast off their tips. In the case of *Celtis occidentalis* this found expression in another way. A number of trees were found early in August, on the Germantown road, on the way to the Soldiers' Home, which had lost all the tips of this year's normally produced branches. But in the case of many of the lower branches the uppermost scaly bud had not waited till next year for its development, but had renewed growth during the same season. In August the tips of even this second crop of branches had been already cast off in many cases. But here and there the tips were still attached, though turning yellow in color and giving evidence of the location of the future plane of separation. The tips included only a few nodes, and were 4-6 mm. long.

Morus rubra (Fig. 4) has well developed terminal scars, with a depressed central portion. The milky juice of the bark will also serve to distinguish the species when the leaves are gone. In winter the twigs of *Tilia* have a similar appearance, but its terminal scar has no depressed centre.

Ioxylon pomiferum (Fig. 1) was found during the first days of August to have cast the tips of all the more mature branches. But where the hedges had been cut and a fresh crop of branches had appeared many branches were still growing, and the tips were therefore vigorous. Later in the year this younger crop of branches also lost its tips. In the more mature trees all the branches had lost their tips in September.

Platanus occidentalis (Fig. 9) is one of the more interesting of trees which shed the tips of their branches, owing to the fact that the lower part of the connate stipules forms a sheath embracing the stem. That portion of the tip which is destined to fall off, ceases growth quite soon and withers; being surrounded by the sheath of the stipules, it may be either entirely included within the same or it may project a little from the sheath (Fig. A). After a time both the tip of the branch and the surrounding stipular sheath fall off and a terminal scar is left (Fig. B). Both stages were visible during the first week of August. The uppermost subpetiolar bud continues the growth of the branch; this is, however, an axillary bud. It does not become visible until the leaves of that part of the stem which remains have fallen off.

Corylus Americana (Fig. 15) casts off its tips while they are still small. One of these tips is here figured. The axillary scaly buds are small and oval or rounded, showing but three or four scales exteriorly; the base of the leaves is distinctly and strongly heart shaped. *Ostrya Virginica* (Fig. 16) has long, pointed axillary scaly buds, showing six or more scales exteriorly. The petioles about equal the buds in length. The lower half of the leaves is wedge-shaped, with a narrow base. The tip of the leaves is long, almost awl-pointed. *Carpinus Virginiana* (Fig. 17) has ovate obtuse scaly axillary buds. The petiole of the leaves is more than three times as long as the subtended scaly buds. The lower half of the leaves is much less evidently wedge-shaped, and the base is more rounded than in the last species. The short, almost abruptly pointed tip of the leaves is quite a useful distinguishing feature. In all three species just enumerated, the terminal scar is very tiny, and often difficult to find. Their leaves are alternate, and distichous. In the scaly buds this phyllotaxy is obscured by the fact that most of the scales represent stipules, and hence occur in pairs; on this account the distichous arrangement of the elements of the bud cannot be readily made out. This characteristic will serve to distinguish these genera from the ordinary distichous plants during winter months. Species of *Quercus*, *Castanea* and *Fagus* show terminal scaly buds.

Some species of *Salix* show terminal scars (Fig. 13) Observed species of *Populus* have terminal scaly buds.

Some species of *Smilax* show at times a short shriveled up remnant of the tip of the branches, at others a terminal scar (Fig. 23).

The best cases of groups of plants casting off the tips of their branches quite generally are the Leguminosæ, Urticaceæ, the Carpineæ among Cupuliferæ, perhaps the Bignoniaceæ, and to a lesser degree the genera *Tilia*, *Staphylea* and *Aesculus*, the sections *Sumac* and *Lobadium of Rhus*, possibly the Vitaceæ in part, and apparently a fair proportion of the species of the genus *Salix*.

The preceding list includes 23 genera in which the casting off of the tips has been noted with certainty. The list is by no means complete for the northeastern United States, but includes chiefly such plants as the writer could find growing near Dayton, Ohio, and use for the purposes of illustration. They certainly indicate that the method of securing determinate growth by the casting off of the tips of branches (usually early in the summer, and quite generally before the first of August) is a fairly common and normal one, and as such is worthy of mention in discussions of the habits of trees.

One of the most interesting features about the growth of trees is the shortness of the period of development of the twigs of the year. The winter months at Bainbridge, in Georgia, have been unusually severe this year (1893), so that the vegetation was decidedly backward. At the beginning of March very few leaves had made their appearance on trees. At the close of this month quite a number had already developed their terminal scaly buds, or had begun to cast off the tips of their branches. In some cases the terminal buds were seen in but little more than two weeks after the leaves began to appear. The following notes were taken at the end of March: *Æsculus Pavia* had well formed terminal buds; the exterior pair of scales of these buds show a leaf-like tip at first, but this falls off at an early date at a scar having about the level of the top of the bud at this time. Careful search for terminal scars did not reveal any which could not be referred to the casting off of flower peduncles after the period of flowering. *Æ. glabra* is probably in the same case, and it is equally likely that the supposed terminal scars of *Æsculus Hippocastanum* are caused by the falling off of flower peduncles, although I was trying to guard against this error at the time the first part of this paper was written.

Enonymus Americanus in one case had developed the internodes of the scaly bud so much as to elevate the innermost scales 120 mm. above the base of the former winter bud. The leafy portion was 300 mm. long and consisted of 6 pairs of leaves. The terminal bud was already formed. *Acer saccharinum*, *Hamamelis Virginica*, *Cornus florida* and *Viburnum prunifolium* had already terminal scaly buds. The less vigorous branches of *Juglans nigra* had ceased producing new leaves. Several species of oaks had already developed far enough to show terminal buds on many trees while on others the leaves had not yet begun to make their appearance.

Quercus nigra furnished a good example of a plant which has most of the nodes for next year's growth already indicated in the bud. The stipules of 14 leaves showed distinctly that they had formed part of the scaly bud during the winter, and this was, not improbably, also true of most of the stipules farther up. It is evident therefore, that the growth of the new crop of branches was little more than the development of the leaves whose position was already determined in the winter bud. Many beeches, *Fagus, ferruginea*, had formed their terminal buds, although these were still very small and did not at all resemble the winter buds.

Regarding the early development of terminal scaly buds it may be observed that at the time of their detection they are far from being fully developed, and they are often still very dissimilar from their fully grown winter form. Moreover at the time of their first detection the internodes of the new year's twigs have not yet finished their growth, so that the terminal bud is already indicated at a time when the full length of the twig has not yet been attained.

Vaccinium tenellum at the end of March was shedding the tiny tips of the branches consisting of two or three very minute leaves. *Carpinus Virginiana* was shedding tips about 3 mm. long, sometimes longer, of which the leaf elements could be recognized more readily. Although the old branches of *Leucothoe axillaris* gave evidence that they had shed their tips during the preceding year, the new crop of branches had scarcely started in March.

Both methods of terminating the growth of the year, that by means of the formation of terminal scaly buds, and that of casting off the tips of branches, are employed very early in the year, as just seen. When, however, a ligneous plant does not terminate its growth until late in the year, the casting off of the tips of the branches seems to be the rule, where killing back of the tips does not obtain. It would be interesting to learn how many ligneous plants develop terminal scaly buds after the first of June, for example, in a more northern climate. It is believed that the casting off of the tips of branches would be much more common after that date.

Description of Plates CXLVII. and CXLVIII.

Fig. 1. *Ioxylon pomiferum;* with a rounded protuberance at the side of the bud.

Fig. 2. *Cercis Canadensis*; with superposed buds in the last axil.

Fig. 3. *Robinia Pseudacacia;* with the tip destined to be cast off still in position, but with the future plane of separation already indicated; at *a* is the upper one of the series of superposed buds, destined to be cast off, and to leave a small protuberance as at *b*.

Fig. 4. *Morus rubra;* with magnified view of the terminal scar, with a depressed centre.

Fig. 5. *Tilia Americana.*

Fig. 6. *Gleditschia triacanthos;* at *a*, is the upper one of the series of superposed buds destined to be cast off, as at *b;* the remaining buds of the series are usually all sub-petiolar; in the axil of the last remaining leaf, the figure shows the next lower bud, just peeping from beneath the base of the petiole; an upper view of this portion of the branch, somewhat enlarged, is added. The thorn is the equivalent of the upper superposed bud which usually drops off before the close of August.

Fig. 7. *Gymnocladus dioica*; with only the uppermost of the superposed buds of the last remaining axil visible in the figure.

Fig. 8. *Ulmus fulva.*

Fig. 9. *Platanus occidentalis*: two figures; the upper one still retaining the shriveled up tip of the branch, with the enclosing stipules belonging to the last remaining leaf. In the lower figure these have been cast off.

Fig. 10. *Ulmus Americana.*

Fig. 11. *Celtis occidentalis;* the upper-axillary bud strongly recurved, a distinguishing feature of this genus.

Fig. 12. *Staphylea trifolia;* showing the stipules belonging to the upper pair of remaining leaves; also a magnified end view of the terminal scar.

Fig. 13. *Salix.*

Fig. 14. *Æsculus glabra;* when the end of the twig does not fall away, and when there has been no flower cluster, a scaly bud terminates the stem.

Fig. 15. *Corylus Americana;* with a drawing of the small tip which has been cast off.

Fig. 16. *Ostrya Virginica.*

Fig. 17. *Carpinus Virginiana.*

Fig. 18. *Rhus aromatica;* two figures. The branch in most cases is terminated by a flowering catkin destined to blossom next year.

Fig. 19. *Prunus Americana.*

Fig. 20. *Ptelea trifoliata.*

Fig. 21 *Rhus glabra.* The branches are often terminated by the remnants of last season's flower clusters.

Fig. 22. *Lonicera flava*, with the shriveled up tip of the branch adhering.

Fig. 23. *Smilax hispida ;* with a terminal scar. Often the tip of the branches simply shrivels up, and a part or all remains attached to the remainder of the stem.

Fig. 24. *Vitis.*

Fig. 25. *Calycanthus floridus.*

Fig. 26. *Ampelopsis quinquefolia.*

In all the figures *t. sc.* indicates the terminal scar; *shr. tp.*, the shriveled tips remaining in case of some plants, and *t*, the scar left by the casting off of the tendrils.

A new Fossil Palm from the Cretaceous Formation at Glen Cove, Long Island.

By Arthur Hollick.

(Plate CXLIX.)

For some years past the writer has been engaged in the study of the Cretaceous formation of this vicinity, particularly on Staten and Long Islands, and a considerable amount of material representing the fossil flora of that formation has been collected. The specimens from Staten Island have already been described,* —those from Long Island it is hoped to describe in full in the near future, but in the meantime it has been thought best to publish in advance the accompanying description and plate.

Probably the greatest surprise experienced in the study of the above mentioned material was in the discovery of an undoubted palm leaf. The significance of this discovery from the geological standpoint need not here receive more than brief mention, as this will be fully discussed elsewhere. It is sufficient to say that the other fossil leaves associated with it show the geological horizon to be the equivalent of the Amboy clays of New Jersey and other middle Cretaceous strata in America and Europe, from none of which have palms been definitely recorded. In fact the presence of palms in lower and middle Cretaceous strata is so rare, if not entirely wanting, that this discovery seems to warrant special attention. They appear in great abundance in upper Cretaceous and Tertiary rocks, and their sudden appearance without any apparent ancestry has always been a puzzle. The significance of the find may therefore be appreciated.

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* Trans. N. Y. Acad. Sci. xi. 96–103, Plates i.–iv. and xii. 1–12, Plates i.–iv.

The specimen in question evidently belongs with the tribe Corypheæ, and its nearest living allies are to looked for in the genera *Trithrinax*, *Copernicia*, *Thrinax* or *Serenœa* (*Sabal*). The imperfect condition of our specimen does not admit of accurate comparison, but there seems to be but little doubt that it is allied to this group, and as we find associated with it leaves of trees which demonstrate that they were the ancestors of our living *Liriodendron*, *Platanus*, *Sassafras*, etc., we are certainly within the bounds of reason when we infer that we have here one of the ancestors of our Southern "Palmetto," as I have indicated in the generic name. The specific name has been adopted in honor of Prof. Jas. F. Kemp, of Columbia College, to whom the credit for finding the specimen is due.

Serenopsis, N. Gen.

Leaves small, fan-shaped, deeply pinnatifid, palmately about 18 divided. Rays tapering to acute tips and broadening into blunt wedge-shaped bases.

SERENOPSIS KEMPII. Leaves circular or sub-cordate in outline, somewhat longer than broad, 3 to 3½ inches in diameter. Rays radiating in all directions from the sub-triangular apex of the petiole; confluent for a distance of about ⅛ to ¼ inch from the petiole, then divergent; central ones about 2½ inches long, outer (lower) ones about ½ inch long; average width about $\frac{1}{16}$ inch; margins entire (?); nervation obscure.

Only a single specimen was found. The two figures represent counterparts of the same one.

Botanical Notes.

Scabiosa australis, Wulf.—Mr. Redfield will find on page 46 of the Cayuga Flora a statement of the thorough establishment of *Scabiosa australis*, not only near Farley's Point, Cayuga Lake, but all along the lake shore meadows of Union Springs for five miles. Moreover, a full description of the species is given in the Flora, and the date of its first discovery (the first in America, probably), viz., 1881; also a reference to the possible dissemination of it from the little botanic garden of David Thomas, civil engineer and clever naturalist, who, with other members of the Society of Friends, made their home in this very locality over eighty years ago. He was the author of *Ulmus racemosa*, a characteristic tree of Central New York. In the herbarium of J. J. Thomas the writer found a specimen of this *Scabiosa* collected from the garden of David Thomas nearly seventy years since. There is no question but that the weed has come to stay. It forms a turf of its own in favorable localities, and is more abundant about Union Springs than ten years ago. I have since found it in the township of Montezuma, twenty miles north.

L. S. JR. UNIVERSITY, PALO ALTO. W. R. DUDLEY.

Amarantus blitoides, Watson.—Mr. Lighthipe's note in the February BULLETIN announcing the occurrence of *Amarantus blitoides* in New Jersey within the "one hundred mile limit," prompts me to say that this species is well established within the corporate limits of New York city. It is to be found along the Hudson River Railroad track about Kingsbridge, Mount St. Vincent and Fort Washington, and doubtless at other points even nearer to the city proper. It grows on the gravelly road-bed, sometimes even between the rails, and on the adjoining embankments.

EUGENE P. BICKNELL.

Death of Dr. Vasey.—Dr. George Vasey, Botanist of the United States Department of Agriculture, died at his home in Washington, D. C., after a brief illness, on March 4th, in his seventy-first year. Dr. Vasey's acquaintance with North American Grasses was probably unequalled by that of any living botanist. All the later years of his life have been devoted to their study, and his publications upon them have been numerous and varied. A sketch of his life will appear in a subsequent issue of the BULLETIN.

Dr. Vasey is succeeded by Mr. F. V. Coville, who has been for several years his assistant, and no better choice could have been made in filling the position left vacant. Mr. Coville brings to the post the enthusiasm and activity of youth, high botanical sagacity, tact, a capital scientific education and good administrative ability. He will well represent American Science both here and abroad.

Proceedings of the Club.

TUESDAY, MARCH 14, 1893.

The President in the chair and twenty-six persons present.

The Editor announced that a paper by Prof. L. M. Underwood, on the Bibliography of Hepaticology, would form part I of Vol. IV. of the MEMOIRS, and that Dr. Rusby's first publications upon Mr. Bang's Bolivian collections would form the third part of Vol. III.

Dr. Morong exhibited the interesting fruit of a species of the Asclepiadaceous genus *Exolobus* from Paraguay, and remarked upon the habits of the plant.

The following active members were elected: Mr. Theodore G. White, Mr. Louis Froelich, Mr. Rudolph Weber, Mr. Stewardson Brown, Mr. Joseph D. Crawford.

The announced papers of the evening were then read as follows: "Notes on *Cladosporium fulvum*, by Miss Effie A. Southworth. This fungus is a parasite of the tomato plant, most injurious in the winter season to hot-house plants, thus being especially destructive from an economic point of view. The fungus apparently grows entirely between the cells, and commonly makes its appearance protruding through the stomata. The first appearance is that of whitish spots on the under sides of the leaves, which soon turn yellow, yellow spots at the same time developing opposite these upon the upper surface. The Bordeaux mixture is especially valuable in treatment. Miss Southworth presented a very interesting life history of the plant, well illustrated by blackboard drawing.

"Some Theories about Osmosis," by Dr. Emily L. Gregory. This paper will be published in a subsequent issue of the BULLETIN.

"Preliminary Notes on the Atlantic Coast Species of *Polysiphonia*," by Mr. Carlton C. Curtiss.

WEDNESDAY, MARCH 29, 1893.

Vice President Morong in the chair and twenty-eight persons present.

Dr. D. T. Millspaugh of 89 Hamilton Place, Paterson, N. J., and Prof. Elmer E. Sherman of South Orange, N. J., were elected active members.

The following communications were then presented:

By Mr. Arthur Hollick, "On Palm Leaves from the Cretaceous Strata at Glen Cove, L. I." The paper is printed in the present BULLETIN.

By Dr. Thomas Morong, on "The North American Species of *Smilax*." The paper was fully illustrated by numerous specimens and was discussed by Messrs. Hollick, Curtiss and Rusby.

By Dr. Britton and Mr. Kraemer, "On a Collection of Plants made by Dr. Timothy E. Wilcox, U. S. A., in the Vicinity of Fort Huachuca, Arizona." Several species new to the United States Flora were presented.

The presentation by the editor of a copy of Dr. Morong's Monograph of the North American Naiadaceæ, MEMOIRS, Vol. III., Part 2, elicited an expression of thanks from the author to members of the Club for their assistance, by which it had been possible for his work to become published.

Index to Recent Literature Relating to American Botany.

Abutilon—Ueber die Gattung. A Garcke (Engler's Bot. Jahrb. xv. 480–492).

Agave filifera. L. Münzer (Monatsb. Kakteenk. iii. 17).

Note on the flowering of this species in the Berlin Botanical Garden.

Botanical Congress—An International. Chas. E. Bessey (Amer. Nat. 1893, 279).

Dr. Bessey, as Vice President of the Section of Botany, A. A. A. S., has appointed a committee of eleven botanists to arrange for an international Botanical Congress to be held at Madison next August.

Buttonwood.—The. J. T. Rothrock (Forest Leaves, iv. 5, 6). With a fine illustration of *Platanus occidentalis.*

Catalogue of the Flowering Plants and Vascular Cryptogams, found in and near Lackawanna and Wyoming Valleys, Pa. William R. Dudley and Charles O. Thurston (Wilkes-Barre, Pa., 1892).

This is substantially a reprint of the preliminary list published in 1887 by Prof. Dudley (then of Cornell, now of the Leland Stanford University, Cal.), in the Proceedings of the Lackawanna Institute of Scranton, altered and enlarged by the addition of species since collected, with the aid of Prof. C. O. Thurston, of the Wyoming Seminary at Kingston. The typography is excellent, and the style of the whole and the paper are all that can be desired. The number of additional species reported is not as great, however, as might have been expected. Of the few rare ones new to Pennsylvania *Pyrus sambucifolia*, Cham. and Schlecht., discovered near Luzerne by Prof. Thurston, who has kindly sent me a specimen, is, perhaps, the most interesting. His description of the spot where it was found excludes all suspicion of escape from culture. The only thing that mars the value of this beautiful catalogue is that no herbarium exists behind it, by which its contents could be verified. T. C. P

Coccocypselum hirsutum (Bot. Mag. t. 7278).

Native of Central America and Trinidad.

Compositæ, Observations on the—III. Edward L. Greene (Erythea, i. 53–56).

Discussion of the characters and relationships of the genera *Coleosanthus* and *Kuhnia*.

Cornels or Dogwoods. (Garden, xliii. 152.) *Cornus florida* is figured, and a number of other species mentioned.

Development of Spermagonia in Cæoma nitens. H. M. Richards. (Proc. Amer. Acad.)

This contribution from the Cryptogamic Laboratory of Harvard University (xix) shows that the spermagonia start "from an outgrowth between and not in the epidermal cells of the host." The pressure induced by the multiplication of fungous cells causes a breaking away and final absorption of the adjoining epidermal cells and the abnormal increase in size of those surrounding the forming spermagonium. A plate adds emphasis to the details of the process as described in the paper. B. D. H.

Flora of Cumberland, Md. (5 pages, no author given [Howard Shriver]; no date given [1892].)

An alphabetical list of several hundred species collected for the Cumberland High School.

Immigrant Plants in Los Angeles County, California. Anstruther Davidson (Erythea, i. 56–61; 98–104).

Jussiæa repens of Linnæus. F. von Mueller (Erythea, i. 61, 62).

Prof. Greene prints a letter from Baron von Mueller, calling attention to the fact that the true *Jussiæa repens*, L., occurs only in India, and that the North American plant so-called is probably *J. diffusa*, Forsk.

Lespedeza—The North American Species of. N. L. Britton. (Trans. N. Y. Acad. Sci. xii. 57–68; reprinted as Contrib. Herb. Col. Coll. No. 34.)

Twelve species are recognized and concisely described. Notes are given on distribution and on type specimens. Two new varieties are proposed.

Lichens of Lancaster County, Pennsylvania—Preliminary Enumeration of the. A. A. Heller (pp. 4, Lancaster, 1893).

A list of 78 species, with localities and habitats.

Loco—Some Observations upon. Dr. Mayo (Bull. Kans. Agric. Exp. Sta. No. 35).

The author concludes that the "Loco" disease is the result of malnutrition caused by the affected animals eating freely of *Astragalus mollissimus*, or *Oxytropis Lamberti.* The presence of any narcotic principle in these plants is doubted.

Mangrove-tree—The. (Garden and Forest, vi. 97).

With two illustrations of *Rhizophora Mangle*, one showing the tree rising from a mass of underbrush, the other showing the lower part of the trunk and the roots.

Mamillaria prismatica. (Bot. Mag. t. 7279).

Native of Mexico. A species of the group *Anhalonium.*

Metaspermæ of the Minnesota Valley. Conway MacMillan. (Rept. Geol. and Nat. Hist. Surv. Minn. Botanical Series, i. cloth, pp. 826, two maps; Minneapolis, Minn., dated Dec. 29, 1892).

In his preface the author expresses satisfaction at the action of the Botanical Club of the A. A. A. S., taken at the Rochester meeting of 1892, in its endeavor to establish nomenclature "upon some other than a personal basis," and states that the initial date, 1753, would have been adopted by him, for genera as well as species, in this work, had not most of it been in type when the Club's action was taken. In order to comply with the principle, however, the following list is inserted for the convenience of those who may wish to note the necessary changes:

Mariscus, Hall. (1742). = *Cladium*, P. Br. (1756).
Cyperella, Cram. (1744). = *Juncodes*, Adans. (1763).
Ramium, Rumpf. (1747). = *Boehmeria*, Jacq. (1763).
Stellularia, Linn. (1748). = *Stellaria*, Linn. (1753).
Leuconymphæa, Ludw. (1737). = *Castalia*, Salisb. (1805).
Nymphæa, Ludw. (1737). = *Nymphæa*, Salisb. (1805).
Capnorchis, Ludw. (1737). = *Bikukulla*, Adans. (1763).
Cracca, Linn. (1747). = *Colonilla*, Adans. (1763).*
Ricinocarpus, Burm. (1737). = *Acalypha*, Linn. (1753).
Stellaria, Ludw. (1737). = *Callitriche*, Linn. (1753).
Lapula, Hall. (1745). = *Lappula*, Moench. (1794).
Leptostachya, Mitch. (1748). = *Phryma*, Linn. (1753).
Pentagonia, Sieg. (1737). = *Legouzia*, Dur. (1782).

The rule which excepts duplicate binomials, as *Phragmites Phragmites* (Linn.) from the law of priority, is also gracefully accepted, and wherever such binomials are found in the work the request is made that the second oldest specific name be used, although the author was not and is not now in sympathy with any such exception. The above binomial would thus become *Phragmites vulgaris* (Lam.).

An exceedingly terse and sharp enunciation of the author's views in regard to the question of nomenclature may be found under the heading "Citation of authors of genera and species" beginning on p. 11, which is worthy of attention from all who still believe in the "position of naming-plants-as-one-pleases." In tracing the history of the movement towards a stable system of nomenclature in America, Prof. Britton is given undue prominence. The argument was begun by Prof. Greene.

In its general classification the work is not only well abreast of the times, but far ahead of all our manuals and text books. All schemes of classification are necessarily evanescent or at least should be sufficiently elastic to permit of interpolation or amendment whenever newly discovered facts render it advisable or necessary, and, as the author says: "While, therefore, the constant shifting from one classification to another is exasperating to the conservative student, it is nevertheless a necessary result of advancing information, and to refuse to consider the new systems which may be put forth in scientific fashion, is as unreasonable as it was in those days when the railway carriages were first brought into use for one to insist upon traveling by the old stage lines of an earlier mechanical era."

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* *Cracca*, L., appears in the "Species Plantarum" of 1753.

The author believes that "the eye should be cast forward instead of backward, that the future should receive consideration as well as the past." He also evinces no consideration for those who would leave all changes and innovations in nomenclature and classification to monographers. He believes that the public has a right to demand the best and most advanced ideas and convictions, even in local floras and catalogues, and in this we are in hearty accord, as it is mostly through these that a large number of lay botanists must receive such education, the ordinary text book being necessarily years behind the times.

The scheme of classification adopted in this work is based upon the most recent investigations in plant morphology.

Two main groups are recognized: A. PROTOPHYTA and B. METAPHYTA, based upon the absence or presence of sexuality. Exact limits between the two are necessarily impracticable, on account of the presence of transition forms, some of which seem to indicate a progressive development from the lower to the higher group—others which appear to be undergoing a retrograde metamorphosis. The Metaphyta are divided into I. GAMOPHYTA and II. SPOROPHYTA, dependent upon the development of the fertilized ovum. As examples of i. are given "the lower Zygophyta *and* Oophyta of Bessey, plants like the pond-scum (*Zygnema*) or the black-mould (*Rhizopus, Mucor*)." Division ii. would therefore comprise practically all plants with which we are familiar in the entire range of botany, except what we have been in the habit of calling the Protophyta and lower Thallophyta. In the Sporophyta three "alliances" are recognized:

(I). Thallophyta, which includes the seaweeds, fresh water algae, and the higher spore-fruit-producing fungi, such as mushrooms and puff balls.

(2). Archegoniatæ, which includes such forms as *Chara* and *Nitella*, the Hepaticae, the Musci, the Filices and their allies, Cycads, Conifers, etc.

(3). Metaspermæ, which includes all those plants formerly classed under Angiospermæ, or, in the words of the author, examples of the Metaspermæ may be selected from the great mass of plants which contain their seeds in a closed "ovary," better named "carpellum." These, then, are alone what have been considered by the author in the present work. Even our old and apparently firmly established friends the Mono- and Dicotyledones have been transferred to a more subordinate position than they once held, and we find the metaspermæ divided primarily into Chalazagameæ, consisting of the single genus *Casuarina*, and Porogameæ, which includes all the other Metaspermæ and in which the Mono- and Dicotyledons are at last permitted to figure as subdivisions. The former are not subject to any further subdivisions, but the latter are arranged, in accordance with the morphology of the perianth into Archichlamydaæ [Polypetalæ and Apetalæ], and Metachlamydeæ [Gamopetalæ]. The skeleton scheme of classification would thus appear:

- **A. Protophyta.**
- **B. Metaphyta.**
    - I. GAMOPHYTA.
    - II. SPOROPHYTA.
        - (1) Thallophyta.
        - (2) Archegoniatæ.
        - (3) Metaspermæ.

Metaspermæ.

- (a) Chalazagameæ.
- (b) Porogameæ.
    - 1. Monocotyledones.
    - 2. Dicotyledones.
        - Archichlamydeæ.
        - Metachlamydeæ.

Under this arrangement the list begins with Porogameæ (Monocotyledones), Family Typhaceæ, Genus *Typha*, Species *T. latifolia*, Linn. and terminates with Family Compositæ, Genus *Hieracium*, Species *H. Canadense*, Michx. The total number of families enumerated is 106, genera 407, and species and varieties 1,174.

The number of changes in long established names is necessarily considerable. Most of them have, however, already been adopted by other progressive botanists and have appeared in print elsewhere. We note with some amusement that the author's rigid conscientiousness has caused him to take up Rafinesque's misprint name "*Scoria*," instead of "*Hicoria*," as he originally wrote it. The limitations of many genera and families are curtailed or extended, as the case may be, and several old genera are revived.

The bibliography and synonomy cover families, genera and species and evince an immense amount of careful and conscientious research, which will save many hours of labor to future workers in metaspermic botany for which they owe the author a heavy debt of gratitude. An innovation which will be welcomed by many is the citation, under the genus, of any fossil form which may have been identified. In this connection the geological horizon, locality and authority are given.

Following the list is a general description of the region, which includes its geographical location, physiography, distribution of forest and prairie, soil, climate and geological history. The palæobotanist will find in the chapter entitled, "Relationships of the Metaspermic Flora of the Minnesota Valley," much of interest and more or less food for thought. The old problems in regard to plant dissemination and distribution are again brought forward. "How did the present plant inhabitants enter the Minnesota Valley?" "What relation does this modern plant-population bear to the more ancient one which was overwhelmed by the glacial detritus, piled 250 feet thick over the old level of the country?" "Under what laws did the repopulation of the Valley progress?" "Along what routes did the incoming plants travel?" etc. The author begins this discussion by calling attention to the constant condition of strain or tension that exists between plants or groups of plants in the struggle for existence—in other words their "dynamic inter-relation." Such a condition he thinks should be recognized more fully in terminology and suggests that instead of speaking of a "northern" group of plants we should designate it as the "*south-bound*" group, and similarly a southern group might be called a "*north-bound*" group, as these plants, already established in the north or south, as the case may be, have probably reached their limits of extension to the north and south respectively, and whatever further extension is to be accomplished must be southward for the northern plants and northward for the southern plants. A line or area of tension is thus formed, and if the world in general is considered, two main tension areas or zones will be apparent, one to the north and another to the south of the equator. In these zones of tension, where the competition between northern and southern forms is greatest, transitional floras are to be found. In the Minnesota valley the author notes the fact, which has received attention in other localities, that the southern or north-bound plants are largely endemic, or in other words American in type, while the northern or south-bound ones are generally less so, in other words foreign in type.

The division of the earth into natural vegetation regions has been attempted by several authorities, notably by Griesebach, Engler and Drude, all of whose regional classifications are given in full and discussed in so far as North America is concerned. The author's conclusions are that there is a greater homogeneity in the regions of the northern than in those of the southern hemisphere, the reasons being both geographical and geological. Geographically the facilities for migration and commingling are much more favorable in the northern than they are in the southern hemisphere, which latter consists of a series of isolated areas, whereas the former is practically a compact circle of land surrounding the pole, broken only by narrow bodies or arms of water. Geologically all the evidence is in favor of a closer relationship in recent times between Asia and North America than between the latter and Europe, and modern biological researches strongly emphasize the evidence. It has long been a well recognized fact that the plants of Greenland are remarkably distinct from those of Scandinavia, whereas the floras of Alaska and Northeastern Asia show but slight differences one to the other. The glaciation of the Ice Age also had a profound influence in modifying the distribution of the plants which previous to that time occupied the Arctic and sub-Arctic regions. In North America, where the mountain chains extend north and south, these plants could migrate or remain undisturbed to the south of the ice sheet; whereas in the old world, where the mountain systems are largely east and west, such plants would be cut off from any means of southward migration and would necessarily perish. "Decimation of old world species would thus result in the conditions of difference as seen to-day between the old world and North America."

Returning again to the subject of "Pressures and Tensions," the conclusion is reached that, "Under the positive equatorial pressure opposed by the negative polar pressures, a segregation of metaspermic plants would take place," that is, the weaker or older types of plant life would gradually find themselves crowded out in the struggle for existence. Another result which the author emphasizes is that the weaker ones are forced to fight in the front, and as an example of this principle cites the line between forest and prairie in the Minnesota valley, where he says: "It is not the characteristic grass of the prairie that grows close up to the characteristic tree of the forest, but between the two there is a zone of plants not perfectly established in either forest or prairie. This transitional formation * * * is generally composed of species weaker than the characteristic plants of either formation."

Under the present climatological conditions the author sssumes, just why he does not make apparent, that the equatorial pressure is increasing, while that of the poles is decreasing, and that the line of tension is thus gradually progressing towards higher latitudes, although liable to local fluctuations due to physical and biological causes. In effect, this is putting into a somewhat different shape the observation of recent investigators, that there is an apparent gradual northward movement of our flora, which has been ascribed to a continuous amelioration of climate since Glacial times.

The influence of this pressure is also discussed in its relation to the specialization of the structure and habitat. Thus the least specialized plants, the aquatic, occupy the least specialized habitat, whilst amongst the most highly specialized, as for instance, the epiphytic orchids in the group of Monocotyledones, occupy the most highly specialized habitat.

Secondary longitudinal tensions, which are lines due to local geography, and minor tensions, due to the influence of topography in limited localities, are also discussed.

Under the heading "Outlines of Metaspermic History in the Northern Hemisphere" may be found a brief resume of what is known in regard to the development of the higher forms of vegetable life since Jurassic times, with special reference to the Cretaceous or Tertiary floras which have been identified in the region under discussion. With the advent of the Ice Age of course all these were destroyed except such as could migrate or exist southward. The author concludes that of all these "none showed greater capacity for variation and improvement than the ancestral forms of the modern dominant family of the Compositæ," whose seeds could fly before the prevailing north winds or attach themselves to the fur of migrating animals, and would be assisted on their return by similar influences. Necessarily the changes in soil, climate and topography would so alter the conditions that a majority of the species could not exist over the region once occupied by them. Others perished by the way, and most of them were modified in one direction or another in their Tertiary southward migration and their subsequent northward migration in recent times.

At the present day the same or similar forces are at work changing or modifying the distribution and structure of plants, but a new element, the influence of man, is now at work. Thus in the Minnesota valley he is responsible, according to the author, for the introduction and establishment of 130 alien forms and the extermination of many native ones from localities where they were once abundant.

Under the statistical discussion of the facts, which occupies about 150 pages, at the close of the volume, may be found a great many interesting and often significant results and comparisons, which want of space does not permit us to review.

A complete family, generic and specific index, with synonyms in italics, terminates the work. It could hardly be rendered more exhaustive, and may be taken as a type of what such books should be. We trust that the author has in mind a work which shall cover the Archægoniatæ and that it will be carried to completion in the same thorough, conscientious and progressive spirit.

A. H.

Monarda fistulosa—Notes on, and the Phenomenon of Fertilization in the Flowers of. Thomas Meehan, Ida A. Keller (Proc. Acad. Nat. Sci. Phila., 1892, 449–454; one plate; reprinted).

Monterey Bay—A Month on the Shores of. Marshall A. Howe (Erythea, i. 63–68).

A contribution to the local algology of the California coast with a list of about 105 species collected.

Musci Americæ Septentrionalis, ex operibus novissimis recensiti et Methodice dispositi. Renauld et Cardot (Rev. Bryol. xx. 1–32, 1893).

This second part completes the check-list of North American mosses, with 1370 numbers. The resume at the end states that 675 are endemic; 297 occur in Europe and Siberia; 348 in Europe alone, and 12 in Siberia alone; 91 in the West Indies, Mexico, or South America, and 76 in Japan. We are sorry for the collector who attempts to exchange or complete his herbarium with this as a basis. We note a certain carelessness of citation, for which Macoun's Catalogue is responsible, as in the case of *H. Flemmingii*, Austin (not L. & J.). We had supposed *H. Bergenense*, Aust. was a synonymn of *H. hygrophilum* (Jur.) Sch., but we find both cited as 1230 and 1253. Nos. 1189–1191 are credited to L. & J., not to Austin as they should be, *H. Oakesii*, to Schimper, not to Sullivant, and *H. Pyrenaicum*, which antedates it, according to Lindberg, is ignored.

In fact the whole catalogue shows that we are in need of a new American check-list, on the basis of the Rochester Code, in which some effort shall be made to sift the good from the bad, and the typography shall be less straining to the eyes than the one just printed. We shall hope to see it issued by American authors. E. G. B.

Opening of the Buds of some Woody Plants.—A. S. Hitchcock (Trans. Acad. Sci. St. Louis, vi. 133–141; four plates; reprinted).

Pellæa gracilis (Meehan's Monthly, iii. 33, plate 3).

Pilocereus Melocactus.—K. Schumann (Monatsb. Kakteenk. iii. 20–25).

Native of Brazil.

NEW YORK FUNGI.

The First Century is now ready for distribution, and others will follow as soon as prepared. It is intended to make these sets as complete as possible in Hymenomycetes. Prof. Chas. H. Peck has kindly promised to examine all species of which he is the author. It is hoped that the science of Mycology may be rendered some service by making accessible authentic specimens, and thus helping to avoid the multiplication of synonyms. Price for the First Century, bound, $7.00; unbound, $6.00. Foreign subscriptions 25 cents extra for postage. Those desiring to subscribe or seeking further information, please address

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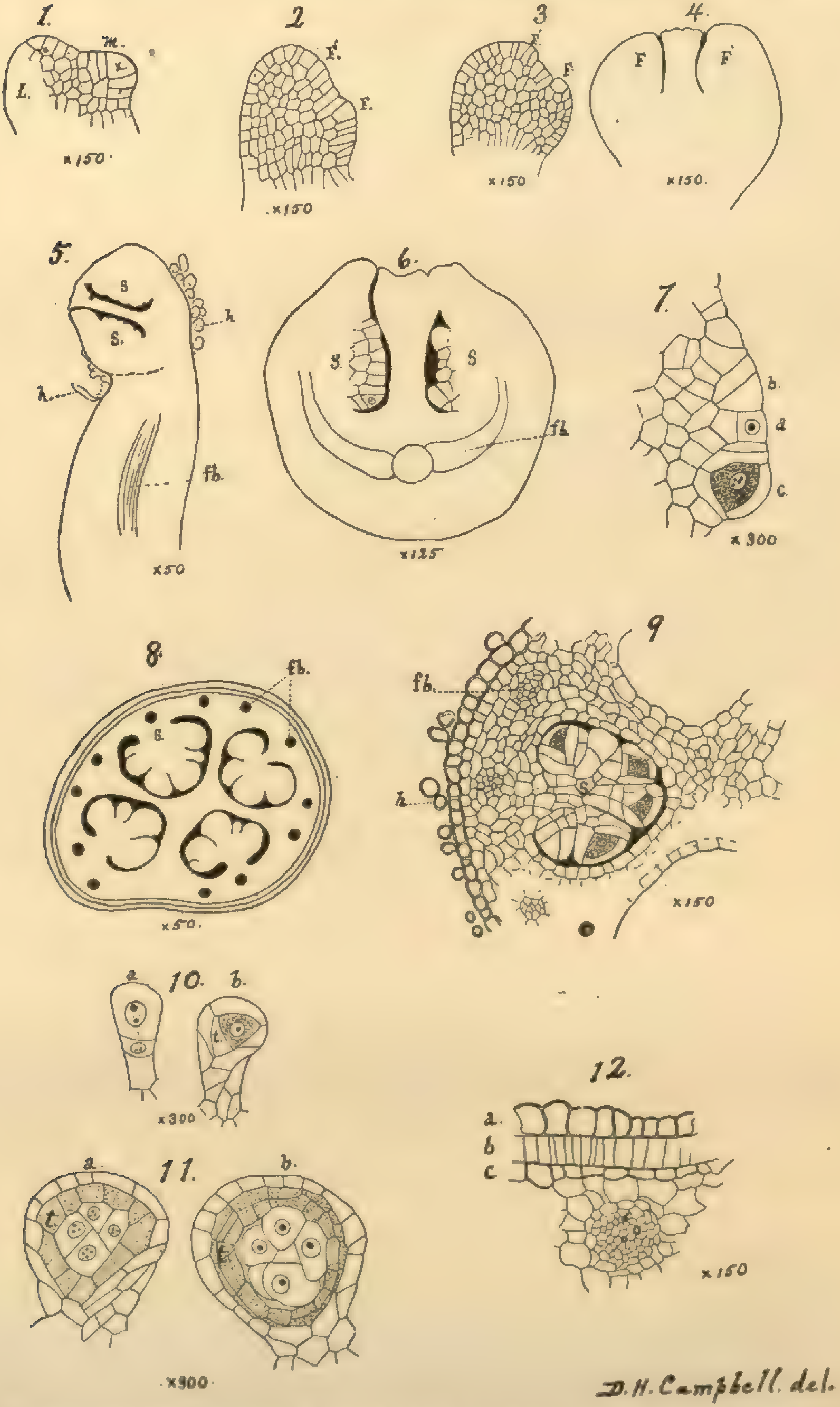
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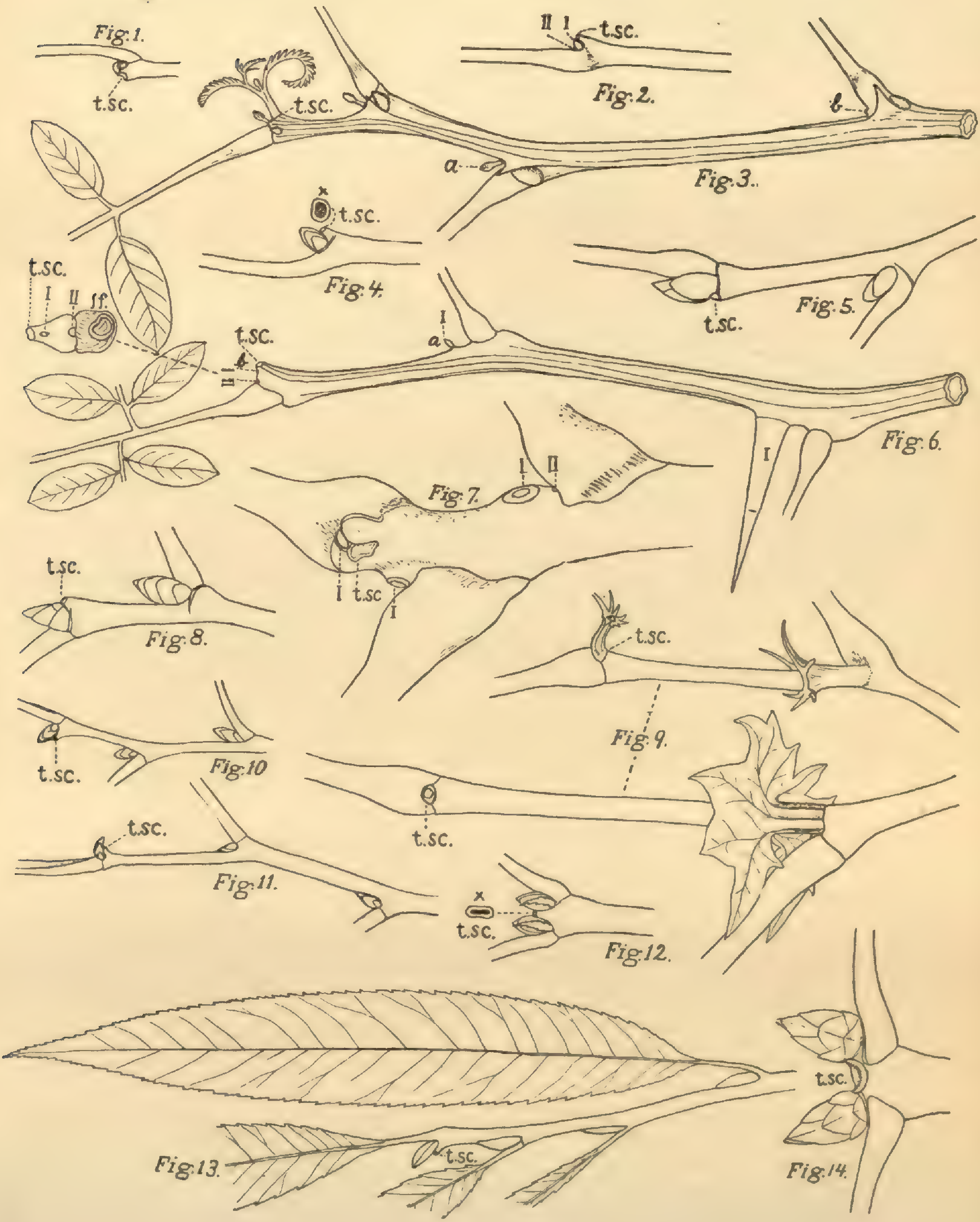
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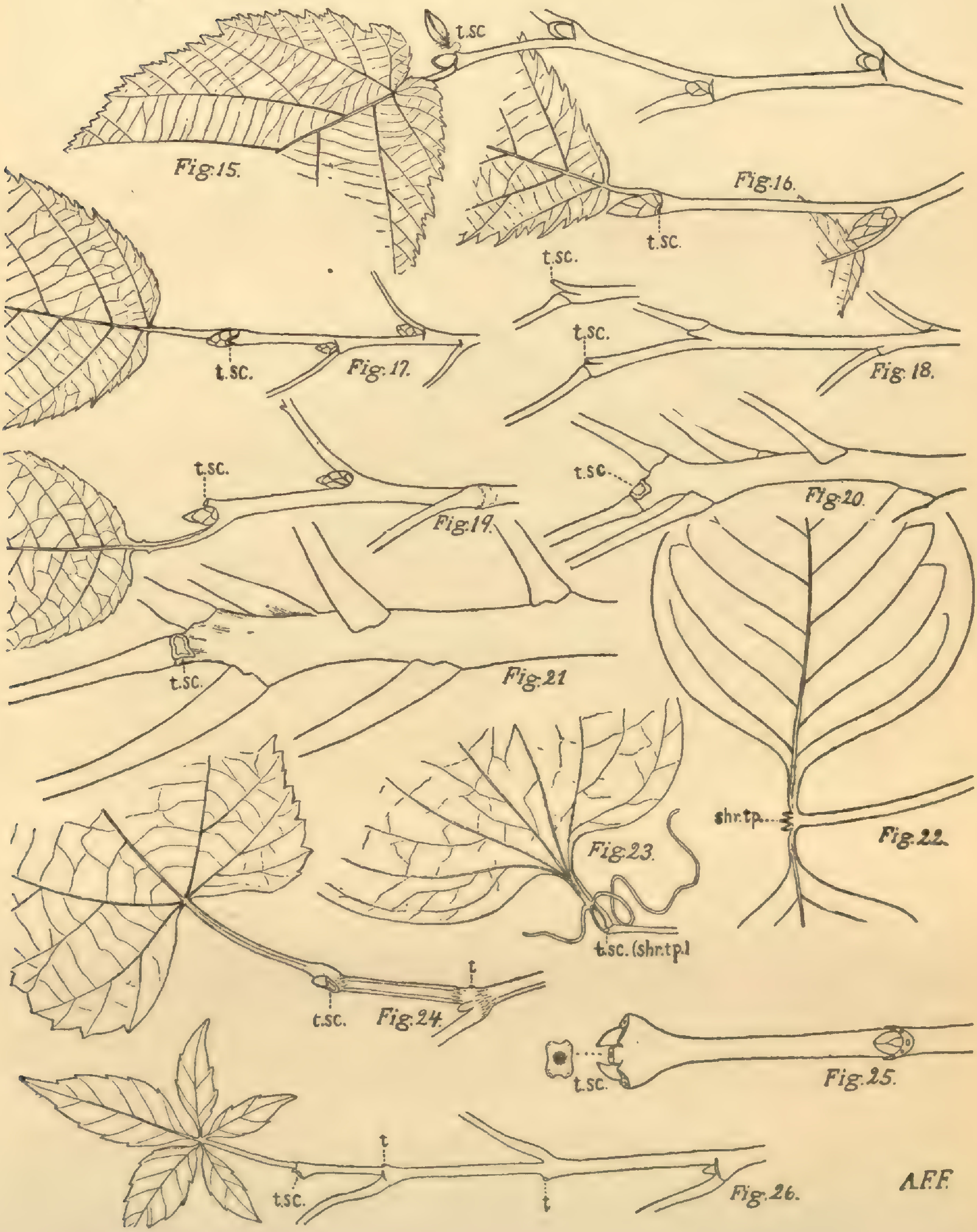
ON THE CASTING-OFF OF THE TIPS OF TWIGS.—A. F. FOERSTE.

BULLETIN OF THE TORREY BOTANICAL CLUB.—PLATE CXLVIII.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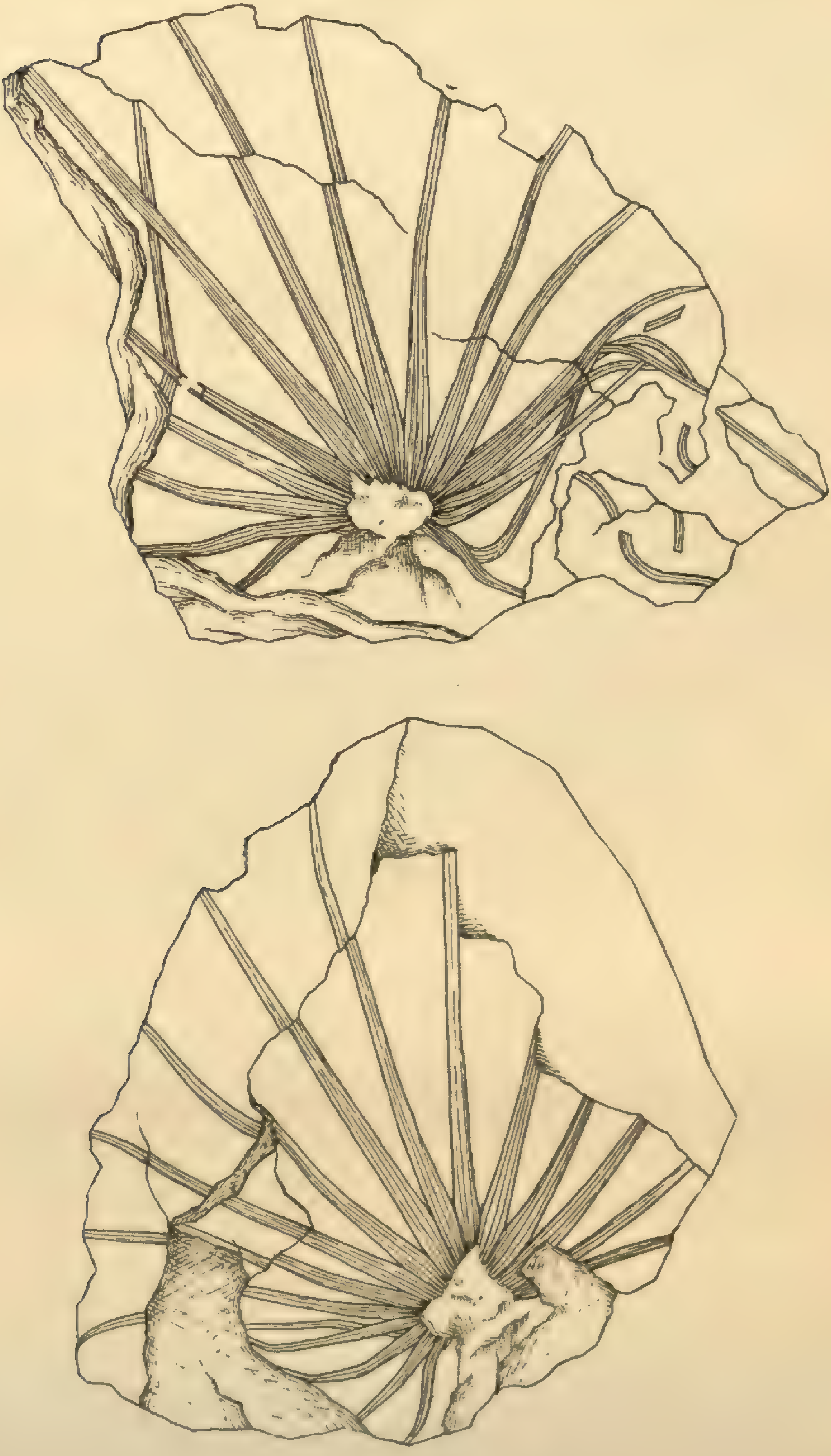
ON THE CASTING-OFF OF THE TIPS OF TWIGS.—A. F. FOERSTE.



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VOL. XX. MAY, 1893. No. 5.

BULLETIN

OF THE

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A MONTHLY JOURNAL OF BOTANY.

EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., May 10, 1893. No. 5.

An Examination of the Seeds of some Native Orchids.

By Carlton C. Curtiss.

(Plates CL.–CLII.)

During the past year some research has been made, at the suggestion of Dr. Britton, on the seeds of the North American Orchids to determine their structure and to note what additional characters of classification and relationship the seeds themselves might afford.

The seeds are membranous, rather elongated capsules, loosely embracing an elliptical, ovate or pyriform nucellus. In organization they indicate a low type of flowering plant. The nucellus is composed of a large number of polyhedral cells, which are filled with a granular, amber-colored mass, imbedded in which is a great abundance of oily matter. The embryo is exalbuminous, and no cotyledon and radicle are formed. The Orchid seeds, therefore, are of interest as furnishing an example of the arrested stage of embryonic development. With germination the cells of the nucellus divide, and eventually form tuber-like buds that ultimately give rise to the plant. In this peculiarity the Orchid resembles many saprophytes. Especially in the structure and outward appearance of its seed does it closely resemble those of several Ericaceæ, particularly *Monotropa.* The nucellus is generally an excellent illustration of the geometrical arrangement of cells in vegetable growth. Two or more confocal periclines are associated with a usually larger number of orthogonal hyperbolic trajectories. See *Pogonia ophioglossoides* (and fig. 17, Plate CLI.).

Surrounding the nucellus is the integument. Before fertilization it presents the usual form as seen in the ovules of other plants, but after fertilization it develops rapidly, assuming an inflated sac-like form, and in the majority of species greatly exceeds the nucellus in its growth. The seeds are anatropous and sessile; and when removed from the placenta the location of the hilum is marked by an opening. This is caused by the shrinking or, possibly, by the partial absorption of the chalaza, remains of which may still be seen in the ripened seed. This leaves the integument alone connected with the placenta. The free ends, therefore, lend to the seeds the appearance of an arillus, the opening at what seems to be the apex being due to the bending in of the cells of the inflated integument as they approach the hilum. The testa is the conspicuous feature of the seed, and with the embryo furnishes one of the family features or distinguishing characters of the order. It is composed of cells of varying forms, as seen in the plates. The outer margins of the cell wall are much thickened. Thus the testa presents in its outward aspect a ribbed surface, and gives to the seed a cage-like appearance. In *Pogonia ophioglossoides* the so-called ribs (thickenings) do not correspond to the cell divisions, but form long bands over the length of the testa, branching and running together somewhat at either extremity, (fig. 19, Plate CLII.). The sides of the cells, as well as all the other margins, are extremely delicate and colorless. The inner face of the cell often receives an elegant sculpturing from delicate bands that are quite characteristic of the several species in which they occur. These lines are noticeably stronger towards the base of the testa in some species, quite fading out at the apex. This faulty development of the nucellus together with the delicacy of the seed coat is doubtless the cause of the relative scarcity of Orchids. Remembering the large number of pods usually produced by each plant and that each pod contains something like six thousand seeds, we realize the enormous fatality among the seeds. This is not in any way connected with a lack of fertilization. The classical work of Darwin has demonstrated the completeness of this process, were it necessary to go back to the flower to ascertain the fact. The whole appearance of the seed is that of a waif, poorly developed and insufficiently protected to retain its vitality, in the extremes of our climate. It would appear that the seed is not in surroundings congenial to its nature, and has not yet been able to adapt itself to its environment. This also doubtless explains the paucity of species found in the Northern United States. The seeds are beautiful objects under the microscope. Elegant in outline their beauty is enhanced by the graceful curves of the cell-margins, which often wind into fantastic figures, or build up the testa with cells of mathematical exactness. The clearness of the cell wall in some species (*Listera cordata*) reminds one of the valves of a diatom, while a study of the delicate markings on the inner surface of the cell, tax not a little the patience and skill of the microscopist.

I have been greatly interested in the examination of specimens of the so-called Vanilla Bean, gathered in various parts of the world. The value of these pods varies greatly, dependent upon the locality in which they grow. So close is their resemblance, however, that the merchants have great difficulty in distinguishing them. The testa is very thick and strong. Instead of a ribbed surface the whole outer wall, save a slit-like central portion, is evenly thickened and forms a heavy plate. Save in this particular and their dark reddish brown color, the seeds are identical in structure with those of our native orchids. The resemblance of the eight specimens examined is very close. With perhaps two exceptions, the seeds would appear to belong to the same species. In the other specimens some variations were noticeable, probably due to climate. The constancy of these features as a basis of distinguishing them would necessitate a wider comparison than I have been able to make.

In examining the seeds of our Eastern orchids examples were chosen in each case that as far as possible would be typical of the species. The estimates are made upon normally developed seeds, which were not distorted by luxuriant growth or dwarfed by untoward circumstances. I believe that a wider study of the forms will make no material change in the data presented. In all possible cases comparison of fruit from widely separate localities has been made, and with rare occurrence has marked variation of the seed been manifest. Occasionally the sculpturing of the cell-wall changes, and often the variation of the cell dimensions is considerable, so that the values given in the measurements of the cells, which are the averages of the cells taken from base to apex of about twenty specimens in every case, cannot be found applicable to all cases, but I trust that the proportion which these figures form will be found to be very constant. Such has been the experience in all cases examined. Furthermore, it should be said that having selected as carefully as possible a seed that illustrated most fully the characters of its species, it was drawn as it actually existed. No attempt has been made to introduce into the drawings the salient points of the species that were not already present. So that while some features may not be well brought out I judge that this course will result in a truer representation of the seeds and in less liability to error.

Looking at the seeds as a whole, a unity of form, structure, and organization appear as constant features of family relationship. A comparison of the seeds, however, reveals wide variation and establishes relationship as told by the seeds themselves widely differing from that of the Manuals of Botany. In some instances the relative positions of genera remained unchanged. More often not only does a misplacement of genera seem manifest, but a total disarrangement of tribal relations results. By a comparison of the figures and their explanations the natural relationship of the species as based upon the seed characters at once becomes apparent. Two extreme types are manifest; the one characterized by its elongated tapering testa and elongated cells. Of this *Tipularia* is the type, to which stand related more or less closely, as is shown by the plates, *Aplectrum* and *Calypso*, *Gyrostachys* and *Peramium*, *Cypripedium*, *Pogonia* and *Orchis*. The opposing type is characterized by obovoid or inflated testæ and shorter cells often equilateral. Of this *Corallorhiza* or *Hexalectris* may be taken as the type, and as related would appear *Listera*, *Achroanthes* and *Liparis*, *Habenaria*, *Arethusa* and *Epipactis* and *Limodorum*.

The genera have been taken up in the sequence followed in the Sixth Edition of Dr. Asa Gray's Manual of Botany, of the Northern United States.

1. ACHROANTHES, Raf.

Achroanthes unifolia (Michx.) Raf. (*Microstylis ophioglossoides*, Nutt.) Testa obovoid, about twice as long as thick, averaging

0.343 × 0.19 mm. Cells irregularly polygonal, becoming longer and narrower toward the summit, about twice as long as wide, averaging 0.047 × 0.022 mm. (Plate CL., figs. 1, 1a.)

2. LIPARIS, Richard.

Liparis liliifolia (L.) Richard. Testa oblong, slightly narrowed at base, about three times as long as thick, averaging 0.35 × 0.12 mm. Cells regular, oblong, about three times as long as wide, averaging 0.05 × 0.017 mm. (Plate CL., fig. 2.)

3. CALYPSO, Salisb.

Calypso bulbosa (L.) Reichenb. (*Calypso borealis*, Salisb.) Testa oblong, tapering towards apex, about five times as long as thick, averaging 0.59 × 0.125 mm. Cells regular, oblong, averaging 0.085 × 0.025 mm., thus over three times as long as broad. Inner cell wall finely reticulated. (Plate CL., figs. 3, 3 a.)

4. TIPULARIA, Nutt.

Tipularia unifolia (Muhl.) B. S. P. (*Tipularia discolor*, Nutt.) Testa oblong, acute, about four and a half times as long as thick, averaging 0.534 × 0.121 mm. Cells regular, oblong, about ten times as long as wide, averaging 0.15 × 0.015 mm. Inner cell wall closely, at times loosely reticulated. (Plate CL., figs. 4, 4 a.)

5. APLECTRUM, Nutt.

Aplectrum spicatum (Walt.) B. S. P. (*Aplectrum hiemale*, Nutt.) Testa fusiform, about nine times as long as thick, averaging 1.36 × 0.153 mm. Cells irregularly oblong, about eight times as long as wide, averaging 0.125 × 0.0168 mm. Inner cell wall banded with delicate parallel or branching lines. (Plate CL., figs. 5, 5 a.)

6. CORALLORHIZA, Haller.

Corallorhiza innata, R. Br. Testa obovoid, about twice as long as thick, averaging 0.48 × 0.23 mm. Cells oblong, becoming polygonal at the apex, about twice as long as wide, averaging 0.069 × 0.037 mm. Inner cell-walls sparsely banded, lines very irregular and obscure. (Plate CL., figs. 6, 6a.)

Corallorhiza multiflora, Nutt. Testa oblong-obovoid, about five times as long as thick, averaging 0.70 × 0.172 mm. Cells longer and narrower than in innata, about three times as long as wide, averaging 0.065 × 0.021 mm. Inner cell-wall banded with parallel sometimes anastomosing or branching lines. (Plate CL., figs. 7, 7a.)

7. HEXALECTRIS, Raf.

Hexalectris aphyllus, Raf. Testa elliptical, obtuse, about twice as long as thick, averaging 0.485 × 0.221 mm. Cells elongated, becoming polygonal towards apex, about three times as long as wide, averaging 0.065 × 0.0196 mm. Inner cell wall marked by excessively branching lines. (Plate CLI., figs. 8, 8a.)

7A. BLETIA, R. P.

Bletia verecunda, Sw. Testa obovoid, about one and a half times as long as thick, averaging 0.231 × 0.171 mm. Cells polygonal, about one and a half times as long as broad, averaging 0.061 × 0.041 mm. Added for comparison with *Hexalectris*. (Plate CLI., fig. 9.)

8. LISTERA, R. Br.

Listera cordata (L.) R. Br. Testa oblong-fusiform, about three and one-half times as long as thick, averaging 0.845 × 0.25 mm. Cells square or polygonal, about one and a half times as long as wide, averaging 0.032 × 0.025 mm. (Plate CLI., fig. 10.)

Listera australis, Lindl. Testa subrotund, about one and a half times as long as thick, averaging 0.362 × 0.20 mm. Cells polygonal, rather longer than broad, averaging 0.036 × 0.028 mm. (Plate CLI., fig. 11.)

Listera convallarioides (Sw.) Nutt. Testa obovoid, about twice as long as thick, averaging 0.412 × 0.207 mm. Cells polygonal, somewhat longer than broad, averaging 0.034 × 0.026 mm. (Plate CLI., fig. 12.)

9. GYROSTACHYS, Persoon.

Gyrostachys cernua (L.) Kuntze. (*Spiranthes cernua*, Richard.) Testa oblong, contracted towards apex, over four times longer than thick, averaging 0.541 × 0.112 mm. Cells regular, oblong, shorter towards apex, about seven times longer than wide, averaging 0.132 × 0.019 mm. Inner cell wall marked by delicate, parallel, subdistant lines. (Plate CLI., figs. 13, 13a.)

10. PERAMIUM, Salisbury.

Peramium repens (L.) Salisb. (*Goodyera repens*, R. Br.). Testa elongated, slightly fusiform, about seven times longer than thick, averaging 0.877 × 0.123 mm. Cells square to oblong, somewhat irregular, about three times longer than broad, averaging 0.052 × 0.019 mm. (Plate CLI., fig. 14.)

Peramium pubescens (L.) (*Goodyera pubescens*, R. Br.). Testa elongated, tapering towards apex, about ten times longer than thick, averaging 0.91 × 0.084 mm. Cells regular, elongated, about eight and a half times longer than broad, averaging 0.121 × 0.014 mm. (Plate CLI., fig. 15.)

11. EPIPACTIS, Hoff.

Epipactis viridiflora (Hoff.) Reich. (*E. Helleborine*, var. *viridens*, A. Gray). Testa elongated, somewhat fusiform, about five times longer than thick, averaging 1.31 × 0.261 mm. Cells polygonal, becoming hexagonal towards base, about twice as long as broad, averaging 0.048 × 0.018 mm. (Plate CLI., figs. 16 and 16a.)

12. ARETHUSA, L.

Arethusa bulbosa, L. Testa oblong, less than twice as long as thick, averaging 0.45 × 0.243 mm. Cells oblong to square, smaller towards base, over twice as long as wide, averaging 0.0425 × 0.0171 mm. (Plates CLI. CLII., figs. 17a and 17.)

13. LIMODORUM, L.

Limodorum tuberosum, L. (*Calopogon pulchellus*, R. Br.) Testa oblong, tapering at apex and base, about three times as long as thick, averaging 0.723 × 0.207 mm. Cells regular, oblong, about two and a half times as long as wide, averaging 0.033 × 0.014 mm. (Plate CLII., fig. 18.)

14. POGONIA, Juss.

Pogonia ophioglossoides (L.) Ker. Testa oblong, tapering at apex, ribbed by longitudinal bands that branch at base and apex, about seven times as long as thick, averaging 1.23 × 0.183 mm. Cells oblong, hexagonal, about three times longer than wide, averaging 0.0946 × 0.0298 mm. Inner cell wall banded by delicate lines that usually fade out above nucellus. (Plate CLII., figs. 19, 19 a.)

Pogonia trianthophorus (Sw.) B. S. P. (*Pogonia pendula*, Lindl.) Testa oblong, about as long as thick, averaging 0.570 × 0.197 mm. Cells oblong or polygonal, about two and a half times longer than wide, averaging 0.0525 × 0.0226 mm. Inner cell wall banded with branching, irregular, sub-distant lines. A variable form, sometimes longer and narrower, or with inflated summit and contracted base, having little in common with the seeds of the species of Eupogonia. (Plate CLII., figs. 20, 20 a.)

Pogonia verticillata (Willd.) Nutt. Testa oblong, about six times longer than thick, averaging 1.16 × 0.176 mm. Cells oblong, about five times longer than broad, averaging 0.110 × 0.0236 mm. (Plate CLII., fig. 21.)

Pogonia affinis, Austin. Testa oblong, about six and a half times longer than thick, averaging 1.183 × 0.170 mm. Cells oblong, about five times longer than broad, averaging 0.117 × 0.0255 mm. (Plate CLII., fig. 22.)

15. ORCHIS, L.

Orchis spectabilis, L. Testa oblong, slightly tapering at ends, about four and a half times longer than thick, averaging 0.57 × 0.12 mm. Cells regular, oblong, about five times longer than wide, averaging 0.117 × 0.022 mm. (Plate CLII., fig. 23.)

16. HABENARIA, Willd.

Habenaria ciliaris (L.) R. Br. Testa oblong, about two and a half times as long as thick, averaging 0.452 × 0.18 mm. Cells oblong or polyhedral, about three times longer than wide, averaging 0.0496 × 0.0157 mm. (Plate CLII., fig. 24.)

17. CYPRIPEDIUM, L.

Cypripedium pubescens, Willd. Testa elongated-fusiform, about five times as long as thick, averaging 1.35 × 0.25 mm. Cells oblong, about five times longer than wide, averaging 0.14 × 0.023 mm. (Plate CLII., figs. 25, 25a.)

In determining species the seeds are not an uncertain element. While it would not be possible to take any one seed, and from it alone locate its position, not a collection of seeds from any fruit has failed to indicate such pronounced individual characters as to render a confusion of species possible. Consider, for example, such troublesome species as *Peramium repens* and *P. pubescens*. While the generic features are pronounced in all the seeds, in each species is apparent certain individual characters that sharply separate them. The more graceful proportions and nicer fitting of cells, together with their elongation and narrowness, easily distinguish *Peramium pubescens*. In *Peramium repens* the cells are shorter, often quite equilateral and intercellular spaces abound. In the species of *Listera* examined the same specific differences exist. In *Listera cordata* is noted a decided departure from *Listera* *australis* and *L. convallarioides* in its elongated testa and the squareness of its cells. The relationship of *Listera convallarioides* and *L. australis* is altogether too close. Of *Listera australis* but indifferent specimens were procurable, and the figure may not be typical. It is separated from *convallarioides* by a longer cell and less rotund testa, and the seed indicates that it is in closer relation with *L. cordata* than is *L. convallarioides*.

It may be worthy of note that the seeds often appeared as indicative of the character or disposition of the plant. In the case of *Peramium* the seeds of the two species examined did not always show constant and pronounced features, and there was an obvious tendency to variation, and assumption of characters common to both.

In *Pogonia* the reverse is to be noted. By reference to the figures it will be seen how strongly the individual features of each species are manifested. These pronounced characters indicate a decided bent in the plant life that has made a sharp demarkation of species. And we would expect to find the species widely separated and rigidly fixed, as is the fact. In the case of *Pogonia affinis* and *Pogonia verticillata* no noteworthy difference exists. The form of seed, character of cell, wall and nucellus are identical. It is to be seriously doubted if any tangible distinction can be maintained between these two species. Furthermore such is the disposition of the genus that we would expect pronounced features to characterize the species. It should be said that but one specimen, and that an excellent one, was examined. I would consider it a favor to receive mature fruit of this plant.

In examining these seeds one fact came out very clearly, i. e. the importance of the fruit as one of the prime factors of classification. This would naturally be the case, for the fruit is the consummation of the plant life. In the nucellus rests the occult power to produce its kind; here also is lodged the impetus to change and variation. Climate and soil and cultivation may assist the plant in its departure from the parent type, but that restlessness which renders the classification of some genera so difficult, is due more to the hidden force lodged by the plant in the nucellus than all other combined influences. It seems reasonable, therefore, that something of this inherent disposition of the plant that is to be, ought to be manifest in the seed and so serve as a truer index to its position and relationship. And this fact, it seems to me, appears with unmistakable clearness in the case of our Eastern Orchids.

Explanation of Plates.

PLATE CL.

Fig. 1. Testa of *Acroanthes unifolia* × 100.
Fig. 1a. Same showing sculpturing of inner cell wall of testa × 325.
Fig. 2. *Liparis liliifolia*, seed × 100.
Fig. 3. *Calypso bulbosa*, seed × 60.
Fig. 3a. Same showing sculpturing of inner cell wall of testa × 325.
Fig. 4. *Tipularia unifolia*, seed × 100.
Fig. 4a. Same showing sculpturing of inner cell wall of testa × 325.
Fig. 5. *Aplectrum spicatum*, seed × 35.
Fig. 5a. Same showing sculpturing of inner cell wall of testa × 180.
Fig. 6. *Corallorhiza innata*, seed × 125.
Fig. 6a. Same showing sculpturing on inner cell wall of testa × 325.
Fig. 7. *Corallorhiza multiflora*, seed × 115.
Fig. 7a. Same showing sculpturing of inner cell wall of testa × 325.

PLATE CLI.

Fig. 8. *Hexalectris aphyllus*, seed × 100.
Fig. 8a. Same showing sculpturing on inner cell wall of testa × 175.
Fig. 9. *Bletia verecunda*, seed × 100.
Fig. 10. *Listera cordata*, seed × 100.
Fig. 11. *Listera australis*, seed × 100.
Fig. 12. *Listera convallarioides*, seed × 100.
Fig. 13. *Gyrostachys cernua*, seed × 120.
Fig. 13a. Same showing the sculpturing on inner cell wall of testa × 175.
Fig. 14. *Peramium repens*, seed × 55.
Fig. 15. *Peramium pubuscens*, seed × 75.
Fig. 16. *Epipactis viridiflora*, seed × 30.
Fig. 16a. Same showing cell wall over nucellus × 200.
Fig. 17a. Nucellus of same showing arragement of cells × 175.

PLATE CLII.

Fig. 17. *Arethusa bulbosa*, seed × 100.
Fig. 18. *Limodorum tuberosum*, seed × 100.
Fig. 19. *Pogonia ophioglossoides*, seed × 55.
Fig. 19a. Same showing sculpturing on inner cell wall of testa × 175.
Fig. 20. *Pogonia trianthophorus*, seed × 100.
Fig. 20a. Same showing sculpturing on inner cell wall of testa × 325.
Fig. 21. *Pogonia verticillata*, seed × 55.
Fig. 22. *Pogonia affinis*, seed × 55.
Fig. 23. *Orchis spectabilis*, seed × 60.
Fig. 24. *Habenaria ciliaris*, seed × 75.
Fig. 25. *Cypripedium pubescens*, seed × 30.
Fig. 25a. Same showing cell wall over nucellus × 100.

A List of the Grasses of Pennsylvania.

BY THOS. C. PORTER.

At the request of the Pennsylvania Board of Managers for the World's Fair, the author prepared a suite of all the grasses known to grow beyond culture within the bounds of the State, and these, mounted on card-boards, are now on exhibition in their building at Chicago. But, as no way seems to be open, through the parties who have the matter in charge, for issuing in pamphlet form for distribution a list copied from what is printed on the card-boards, he has deemed it his right to seek a channel in the pages of the BULLETIN for putting on record and making accessible to the public the results of his labors. The list that follows, much enlarged by additional notes, is in fact a new work.

In it, the names of the counties in which the species were collected are given, with the names of the collectors. Wherever the latter are wanting that of the author is to be supposed. All these species thus noted can be verified by specimens in the Pennsylvania Herbarium of Lafayette College, either by a single one, or by several from different stations in the same county.

Besides this, the Flora of Darlington, for Chester county; that of Barton, for Philadelphia, and the Catalogues of Dr. George Smith, for Delaware; of Dr. I. S. Moyer, for Bucks, and of Professors Dudley and Thurston, for Lackawanna and Luzerne, are cited in brackets.

The numbers attached to the species correspond with those on the card-boards of the Chicago exhibit.

1. PASPALUM SETACEUM, Mx.—In damp, sandy soils.—Delaware, *Dr. Geo. Smith;* Chester, *Porter*, (Fl. Cestrica); Philadelphia; Lancaster; Dauphin; Lebanon; Bucks, (Moyer's Cat.); Northampton.

2. PASPALUM LÆVE, Mx.—Same habitat as the preceding.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Lancaster; York; Lebanon; Northampton.

3. PANICUM FILIFORME, Linn.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Lancaster; Bucks (Moyer's Cat.); Crawford, *Garber.*

4. PANICUM GLABRUM (Schrad.) Gaud.—Nat. from Eu. Common.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Luzerne (Dudley and Thurston's Cat.); Dauphin; Lycoming, *Heller;* Erie, *Garber.*

5. PANICUM SANGUINALE, Linn.—Nat. from Eu. Very common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Franklin; Huntingdon.

6. PANICUM XANTHOPHYSUM, Gray.—In the northeastern counties. Rare.—Lycoming, on "dry slate hills," *McMinn:* Luzerne and Lackawanna, *Dudley.*

7. PANICUM DEPAUPERATUM, Muhl.—On dry hillsides. Frequent throughout.—Delaware; Chester (Fl. Cestrica); Lancaster; Lebanon, *Small;* Bucks (Moyer's Cat.); Schuylkill; Lycoming, *McMinn;* Tioga, *Garber;* Venango, *Garber.*

8. PANICUM SCOPARIUM, Lam.—Not common.—Lancaster; Chester; Northampton, at a few stations.

9. PANICUM DICHOTOMUM, Linn.—Common throughout. Exceedingly variable.—Delaware; Chester; Lancaster; Bucks (Moyer's Cat.); Northampton.

12. PANICUM DICHOTOMUM, L., var. BARBULATUM (Michx.) Vasey.—Chester; Lancaster; Northampton.—Often found with the typical form.

13. PANICUM RAMULOSUM, Michx. (?)—In woods. Frequent throughout.—Chester; Lancaster; Northampton; Carbon, *Kraut;* Huntingdon.

14. PANICUM RAMULOSUM, Michx. (?), var. VIRIDE (Vasey.)—Lancaster; Chester; Northampton.—A delicate grass, entirely glabrous, with slender culms and linear or lance-linear leaves. Growing with the typical form.

15. PANICUM WALTERI, Poir. (*P. latifolium* of Am. authors, not of Linnæus.)—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Luzerne (Dudley and Thurston's Cat.); Huntingdon; Bedford; *Small;* Carbon, *Kraut.*

16. PANICUM WALTERI, Poir., var. MOLLE (Vasey.)—Rare.—Bucks, *H. F. Ruth;* Northampton; Luzerne (Dudley and Thurston's Cat.).

17. Panicum commutatum, Schultes.—Rare.—Lancaster; Northampton.

18. Panicum sphærocarpon, Ell.—Not common.—Chester; Northampton; Luzerne, *Heller.*

19. Panicum unciphyllum, Trin.—Chester, on the serpentine barrens south of Oxford.

20. Panicum clandestinum, Linn.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Northampton; Lancaster; Franklin; Luzerne (Dudley and Thurston's Cat.).—Frequent throughout.

21. Panicum clandestinum, L., var. pedunculatum, Torr.—Philadelphia, *Dr. Jos. Leidy;* Lancaster; Chester; Franklin; Huntingdon; Venango, *Garber.*

22. Panicum viscidum, Ell.—Delaware, at Tinicum, *Aubrey H. Smith.*

23. Panicum microcarpon, Muhl.—Delaware, *Charles E. Smith;* Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Lancaster; Perry, on the shores of the Susquehanna.

24. Panicum capillare, Linn.—Common throughout.—Delaware (Smith's Cat.); Chester; Bucks; Lancaster; Northampton; Huntingdon.

25. Panicum capillare, L.., var. flexile, Gattinger.—Very rare. —Lancaster, in a swamp near Dillerville. The only known station in the State.

26. Panicum proliferum, Lam.—Not uncommon.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Lancaster; Dauphin; Northampton.

27. Panicum miliaceum, Linn.—Fug. from Eu.—Dauphin; Lancaster; Luzerne, *Small* and *Heller.*

28. Panicum verrucosum, Muhl.—Very rare.—Delaware, at Tinicum, the only station known in the State.

29. Panicum anceps, Michx.—Not common.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Lancaster; Lebanon, *Small;* Bucks, *Diffenbaugh;* Lehigh; Northampton.

30. Panicum agrostoides, Muhl.—Common in wet places.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Lancaster; Dauphin; Northampton.

31. Panicum virgatum, Linn.—On rocky shores. Throughout

the State.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Luzerne, *Heller;* Dauphin; Huntingdon, *Lowrie;* Erie, *Clinton, Garber.*

32. PANICUM CRUS-GALLI, Linn.—Nat. from Eu. Common.—Delaware (Smith's Cat.); Chester; Bucks (Moyer's Cat.); Lancaster; Franklin; Northampton.

33. PANICUM AMARUM, Ell., var. MINOR, Vasey & Scribner.—Philadelphia, *Diffenbaugh.* A plant of the coast of New Jersey, introduced and spreading from ballast-heaps.

34. CHAMÆRAPHIS VERTICILLATA (L.). (*Setaria verticillata,* Beauv.). —Adv. from Eu. Not common.—Bucks (Moyer's Cat.); Northampton; Lancaster.

35. CHAMÆRAPHIS GLAUCA (L.) Kuntze. (*Setaria glauca,* Beauv.).—Nat. from Eu. Common throughout.—Delaware (Smith's Cat.); Chester; Philadelphia (Barton's Flora); Bucks (Moyer's Cat.); Lancaster; Huntingdon, *Lowrie;* Northampton.

36. CHAMÆRAPHIS VIRIDIS (L.). (*Setaria viridis,* Beauv.).—Nat. from Eu. Very common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Franklin; Lancaster.

37. CHAMÆRAPHIS ITALICA (L.) Kuntze. (*Setaria Italica,* Kunth).—Adv. from Eu. Escaped from culture.—Chester (Fl. Cestrica); Northampton; Luzerne (Dudley and Thurston's Cat); Lycoming, *Small and Heller.*

38. CENCHRUS TRIBULOIDES, Linn.—Chester (Fl. Cestrica); Delaware (Smith's Cat.); Bucks, (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Dauphin; Lancaster; Northampton.—Sandy river banks and fields.

39. SPARTINA CYNOSUROIDES (Linn.) Willd.—Not common. Rocky shores of the large rivers.—Chester (Fl. Cestrica); Philadelphia, *E. Diffenbaugh;* Bucks, *H. F. Ruth;* York; Dauphin; Allegheny, *Knipe;* Venango, *Kraut;* Erie, *Garber.*

40. SPARTINA JUNCEA (Michx.) Willd.—A salt-marsh plant, common on the New Jersey coast. Introduced upon ballast-grounds.—Philadelphia, *Diffenbaugh.*

41. TRIPSACUM DACTYLOIDES, Linn.—Rare and local.—Berks, near Reading, *Dr. J. P. Hiester;* Chester, in the Great Valley, (Fl. Cestrica); Lancaster, on the Lower Susquehanna.

42. ZIZANIA AQUATICA, Linn.—Swampy margins of rivers.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia; Bucks (Moyer's Cat.); Lancaster, above Shock's Mill.

43. HOMALOCENCHRUS VIRGINICUS (Willd.) Britton.—Common in wet places.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Franklin, *Traill Green;* Huntingdon; Luzerne (Dudley and Thurston's Cat.).

44. HOMALOCENCHRUS ORYZOIDES (Linn.) Poll.—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Northampton; Lancaster.

45. ERIANTHUS ALOPECUROIDES (Linn.) Ell.—Very rare and local.—Bucks, *Burk, I. C. Martindale.*

46. ANDROPOGON PROVINCIALIS, Lam., (*A. furcatus*, Muhl.).—Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia (Barton's Flora); Lancaster; Bucks (Moyer's Cat.); Northampton; Luzerne (Dudley and Thurston's Cat.); Huntingdon, *Lowrie.*

47. ANDROPOGON SCOPARIUS, Michx.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia (Barton's Fl.); Bucks (Moyer's Cat.); Northampton; Luzerne (Dudley and Thurston's Cat.); Lancaster; Dauphin; Lebanon, *Small;* Centre, *Rothrock;* Blair, *Bœcking;* Erie, *Clinton.*—Common over the whole State.

48. ANDROPOGON VIRGINICUS, Linn.—Not frequent.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia (Barton's Fl.); Bucks (Moyer's Cat.); Lancaster; Northampton; Luzerne (Dudley and Thurston's Cat.).

49. ANDROPOGON GLOMERATUS (Walt.), B. S. P.—Rare.—Delaware, *Charles E. Smith;* Chester (Fl. Cestrica); Lancaster.

50. CHRYSOPOGON NUTANS (Linn.) Benth.—On rocky banks; frequent.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Luzerne (Dudley and Thurston's Cat.); Huntingdon, *Bœcking.*

50a. SORGHUM HALAPENSE (Linn.) Pers.—Fugitive. Escaped from culture.—Philadelphia, *Burk.*

51. PHALARIS CANARIENSIS, Linn.—Fug. from Eu.—Lancaster; Philadelphia, *Charles E. Smith;* Northampton, *Tyler.*

52. PHALARIS ARUNDINACEA, Linn.—In wet places. Common throughout.—Delaware (Smith's Cat.); Philadelphia (Barton's Fl.); Chester (Fl. Cestrica); Lancaster; Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Huntingdon, *Lowrie.*

53. ANTHOXANTHUM ODORATUM, Linn.—Nat. from Eu.—Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia; Bucks (Moyer's Cat.); Berks; Monroe; Blair, *Lowrie.*

54. ALOPECURUS GENICULATUS, Linn.—Fug. from Eu.—Philadelphia, *Diffenbaugh.*—On the ballast heaps.

55. ALOPECURUS GENICULATUS, Linn., var. ARISTULATUS (Michx.), Munro.—Rare and local.—Delaware (Smith's Cat.); Huntingdon; Luzerne, *Thurston.*

56. ARISTIDA DICHOTOMA, Linn.—Common throughont.—Delaware (Smith's Cat.); Chester; Lancaster; Lebanon; Bucks (Moyer's Cat.); Philadelphia (Barton's Fl.); Northampton.

57. ARISTIDA GRACILIS, ELL.—Dry roadsides. Less common than the former.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Franklin.

58. ARISTIDA PURPURASCENS, Poir.—Not common.—Bucks (Moyer's Cat.); Northampton; Lancaster; York.—On sandy river-banks.

59. STIPA AVENACEA, Linn.—Very rare and local.—Delaware; Chester, *J. J. Carter;* Philadelphia, *Diffenbaugh.*

60. ORYZOPSIS MELANOCARPA, Muhl.—Frequent. In rocky woods.—Bucks (Moyer's Cat.); Philadelphia, *Chas. E. Smith;* Lancaster; Luzerne, *Small* and *Heller;* Huntingdon, *Lowrie.*

61. ORYZOPSIS ASPERIFOLIA, Michx.—Rare.—Monroe; Luzerne Dudley and Thurston's Cat.); Huntingdon; Blair, *Lowrie;* Erie, *Guttenberg.*

62. ORYZOPSIS JUNCEA (Michx.) B. S. P.—Very rare. In the mountain regions.—Monroe, near Naomi Pines; Luzerne, *Rothrock.*

63. MILIUM EFFUSUM, Linn.—Rare. In the northern counties.—Wayne, *Garber;* Sullivan, *Chas. E. Smith;* Mercer, *Garber.*

64. MUHLENBERGIA SOBOLIFERA (Muhl.) Trin.—Frequent throughout. In rocky woods.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Huntingdon, *Lowrie.*

65. Muhlenbergia racemosa (Michx.) B. S. P.—In bogs. Not common.—Chester (Fl. Cestrica): Bucks, *H. F. Ruth;* Lancaster; Monroe; Lycoming, *McMinn;* Crawford, *Garber.*

66. Muhlenbergia Mexicana (Linn.) Trin.—Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Franklin; Huntingdon; Clearfield, *McMinn.*

67. Muhlenbergia sylvatica (Torr.) T. and G.—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Lancaster; Lebanon, *Small;* Clearfield, *McMinn.*

68. Muhlenbergia tenuiflora (Willd.) B. S. P.—Not rare. In rocky woods.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Huntingdon; Blair, *Lowrie.*

69. Muhlenbergia diffusa, Schreb.—Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks, (Moyer's Cat.); Northampton; Lancaster; Blair, *Bœcking;* Huntingdon, *Lowrie.*

70. Muhlenbergia capillaris, Kunth.—Very rare.—Lancaster, at Safe Harbor, the only station known in the State (Oct. 8, 1864).

71. Brachyelytrum aristosum (Michx.) B. S. P.—Common throughout. In rocky woods.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Lancaster; Northampton.

72. Heleochloa schœnoides (Linn.) Host.—Nat. from Eu.—Philadelphia (*Crypsis Virginica* of Barton's Fl., 1, p. 45), *James, Burk, Diffenbaugh;* Delaware, *Dr. G. Smith;* Lancaster, at Columbia, *Garber.*

73. Phleum pratense, Linn.—Nat. from Eu.—Common throughout.—Lancaster, *Small;* Franklin; Northampton.

74. Sporobolus asper (Michx.) Kunth.—Rare. On sandy riverbanks.—Dauphin; Lancaster; Montgomery, *Diffenbaugh;* Northampton.

75. Sporobolus vaginæflorus (Torr.) Vasey.—Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Lancaster; Northampton; Huntingdon; *Lowrie.*

76. Sporobolus Indicus (L.) R. Br.—From Trop. Am.—Philadelphla, *C. F. Parker.*—Spreading to waste places from the ballast-heaps.

77. Sporobolus heterolepis, Gray.—Very rare and local.—Lancaster, near New Texas, *J. J. Carter.* The only station known.

78. Sporobolus cryptandrus (Torr.) Gray.—Erie, on Presque Isle, *Garber*, (Sept. 1868).

79. Agrostis perennans (Walt.) Tuck.—Common throughout. In damp woods.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Northampton; Dauphin; Lancaster; Centre, *Lowrie;* Huntingdon, *Bœcking.*

80. Agrostis hiemalis (Walt.) B. S. P.—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Monroe; Lancaster.

81. Agrostis canina, Linn.—Rare. In the mountain regions.—Northampton; Dauphin, *Small;* Blair, *Lowrie.*

82. Agrostis alba, Linn.—Nat. from Eu. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Monroe; Lycoming; Huntingdon, *Lowrie;* Lycoming.

83. Agrostis alba, Linn., var. vulgaris (With.) Thurber.—Frequent throughout. Everywhere with the typical form.—Northampton; Monroe.

84. Cinna arundinacea, Linn.—Delaware (Smith's Cat.) Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Lackawanna (Dudley and Thurston's Cat.); Lancaster; Northampton; Huntingdon; Blair, *Bœcking.*

85. Cinna pendula, Trin.—Rather frequent on the mountains of the northern counties.—Monroe; Lackawanna; Huntingdon, *Garber;* Blair, *Lowrie.*

86. Calamagrostis Canadensis (Michx.) Beauv.—Abundant in the mountain-swamps of the State.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (*H. F. Ruth*); Northampton; Lancaster; Dauphin; Carbon; Monroe; Elk, *McMinn;* Tioga, *Garber;* Venango, *Garber;* Erie, *Garber.*

87. Calamagrostis confinis, Nutt.—Very rare and local.—Lycoming, in a bog near Muncy, *McMinn* (1865).

88. CALAMAGROSTIS NUTTALLIANA, Steud.—Rather frequent in bogs and damp woods.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks, *H. F. Ruth;* Monroe; Lancaster; Lebanon, *Heller;* Dauphin; Huntingdon.

89. CALAMAGROSTIS PORTERI, Gray.—Local and not common.—Huntingdon. Discovered by the author in dry woods on the hills along the Little Juniata river near Barree Forge, Aug. 12, 1862. Afterwards it was found on Warrior's Ridge, by *J. R. Lowrie*, near Warriorsmark in the same county. It was also reported in Prof. Dudley's Flora as growing in Cayuga Co., N. Y. Specimens of the preceding species which sometimes has the leaves bearded below the junction of the blades with the sheath have been mistaken for it.

90. AMMOPHILA ARENARIA (Linn.) Link.—Erie, *G. W. Clinton.*—A coast-plant collected on Presque Isle, the only station known in the State.

91. AIRA PRÆCOX, Linn.—Adv. from Eu. Northampton, near Bethlehem, *Fiot*—the only known station.

92. AIRA CARYOPHYLLEA, Linn.—Fug. from Eu.—Philadelphia, on ballast-heaps, *I. C. Martindale.*

93. DESCHAMPSIA FLEXUOSA (Linn.) Griseb.—Not frequent. On rocky banks and cliffs.—Lackawanna (Dudley and Thurston's Cat.); Monroe, *Knipe;* Lancaster; Franklin.

94. DESCHAMPSIA CÆSPITOSA (Linn.) Beauv.—Very rare and local.—Chester (Fl. Cestrica); Lancaster; Monroe, *Traill Green.*

95. HOLCUS LANATUS, Linn.—Nat. from Eu. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Northampton; Lancaster.

96. TRISETUM PENNSYLVANICUM (Linn.) B. S. P.—In swamps. Sparingly throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Dauphin; Lancaster; Lycoming, *McMinn.*

97. AVENA STRIATA, Michx.—Very rare. A northern species.—Sullivan, *Aubrey H. Smith, Chas. E. Smith;* Elk, *McMinn.*

98. ARRHENATHERUM ELATIUS (Linn.) Mert. and Koch.—Adv. from Eu. Rare. Found occasionally along roadsides and in woods.—Chester (Fl. Cestrica); Lancaster, *Small;* Northampton.

99. Danthonia spicata (Linn.) Beauv.—Very common throughout. In open woods and on dry hillsides.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Monroe; Lycoming, *McMinn.*

100. Danthonia compressa, Austin.—Rare. A mountain species.—Monroe, *Britton;* Berks; *Crawford;* Lackawanna; Lycoming, *McMinn.*

101. Danthonia sericea, Nutt.—Lycoming, *McMinn.* "On dry slate hills." Very rare.

102. Capriola Dactylon (L.) Kuntze. (*Cynodon Dactylon*, Pers.).—Introduced from Europe and spreading from ballast-heaps.—Philadelphia, *Diffenbaugh;* Bucks, at Bristol, *Diffenbaugh;* Bethlehem, *Bechdolt.*—Abundant in the South.

103. Bouteloua curtipendula (Michx.) A. Gray.—Rare.—Chester (Fl. Cestrica); Northampton; Lancaster; Huntingdon, *Lowrie.*

104. Eleusine Indica (Linn.) Gært.—Nat. from India. Very common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Northampton; Huntingdon, *Lowrie.*

105. Eleusine Ægyptiaca (Willd.) Pers.—Adv. from Eu.—Delaware, "established at some places and spreading," *Dr. G. Smith;* Philadelphia, *Diffenbaugh.*—Spreading from ballast-heaps.

106. Sieglingia flava (L.) Kuntze. (*Triodia sesleroides*, Benth.).—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Lancaster; Northampton; Luzerne (Dudley and Thurston's Cat.); Huntingdon.

107. Triplasis purpurea (Walt.) Beauv.—Erie, on Presque Isle, *Garber.*—A coast-plant. The only station known in Pennsylvania.

108. Phragmites vulgaris (Lam.) B. S. P.—Rare and local.—. Delaware, *Dr. G. Smith;* Chester (Fl. Cestrica); Erie, on Presque Isle, *Garber.*

109. Kœleria cristata, Pers.—Very rare.—Found only on Campbell's Ledge, on the Susquehanna river above Moeanaqua (Dudley and Thurston's Cat.), *Dudley.*

110. Eatonia Pennsylvanica (Spreng.) A. Gray.—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks, *H. F. Ruth;* Northampton; Lancaster; Tioga, *Garber.*

111. EATONIA OBTUSATA (Michx.) A. Gray.—Rare and local.—Chester (Fl. Cestrica); Lancaster.

112. EATONIA DUDLEYI, Vasey.—Rather frequent in the central mountain-region.—Lancaster; Lehigh, *Garber;* Monroe, *Britton;* Huntingdon, *Lowrie.*

113. ERAGROSTIS HYPNOIDES (Lam.) B. S. P.—Common along sandy river-shores.—Franklin; Lancaster; Bucks, *H. F. Ruth;* Tioga, *Garber;* Huntingdon, *Lowrie;* Northampton.

ERAGROSTIS MINOR, Host.—Adv. from Eu. Rare.—Franklin, *Traill Green;* Bucks.

114. ERAGROSTIS MAJOR, Host.—Nat. from Eu. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Philadelphia, *Diffenbaugh;* Lancaster; Franklin; Huntingdon, *Lowrie.*

115. ERAGROSTIS PILOSA (Linn.) Beauv.—Nat. from Europe. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Monroe, *Knipe;* Lancaster; Franklin, *Traill Green;* Fayette, *Garber.*

116. ERAGROSTIS PURSHII, Schrad. Frequent in the eastern counties. On sandy river-banks.—Northampton; Dauphin; Lancaster, *Heller.*

117. ERAGROSTIS FRANKII, Meyer.—Rare and local.—Chester, *Canby;* Lancaster; Monroe, *Knipe;* Northampton.

118. ERAGROSTIS CAPILLARIS (Linn.) Nees.—Frequent throughout.—Chester (Fl. Cestrica); Delaware (Smith's Cat.); Northampton; Lancaster; Huntingdon, *Lowrie, Boecking.*

ERAGROSTIS PECTINACEA (Michx.) A. Gray.—Rare. Bucks, *I. C. Martindale.*

119. ERAGROSTIS PECTINACEA (Michx.) A. Gray, var. SPECTABILIS, A. Gray. Frequent in the eastern counties.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Philadelphia, *James;* Lancaster.

120. MELICA MUTICA, Willd.—Berks, near Reading, *Dr. J. P. Hiester;* Lancaster, at Safe Harbor.—Very rare and local.

121. UNIOLA LATIFOLIA, Michx.—Rare and local.—Lancaster, shores of the Susquehanna, *Diffenbaugh, Heller.*

122. UNIOLA LAXA (Linn.) B. S. P.—Very rare and local.—Delaware, at Tinicum, *Chas. E. Smith;* Bedford, *Aubrey H. Smith.*

123. DISTICHLIS SPICATA (Linn.) Greene.—Philadelphia, *Parker.*—From the ballast-heaps. Common on the sea-coast of New Jersey.

124. DACTYLIS GLOMERATA, Linn.—Nat. from Eu. Escaped from culture and common throughout.—Northampton.

BRIZA MAXIMA, Linn.?—Lancaster, on the roadside near Smithville, *Small.*—Fug. from Eu.

125. FESTUCA MYURUS, Linn.—Nat. from Eu.—Bucks, near Quakertown, *Dr. J. B. Brinton*—the only station known in Pennsylvania. Common in Southern New Jersey.

126. POA ANNUA, Linn.—Nat. from Eu. Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Northampton; Lancaster; Huntingdon, *Lowrie;* Blair, *Boecking.*

127. POA COMPRESSA, Linn.—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Northampton; Lancaster; Franklin; Allegheny, *Knipe.*

128. POA SEROTINA, Ehrh.—Rare and local.—Tioga, *Garber;* Crawford, *McMinn.*

129. POA PRATENSIS, Linn.—Nat. From Eu. Very common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Northampton; Lancaster; Franklin; Blair, *Boecking;* Erie, *Garber.*

130. POA TRIVIALIS, Linn.—Nat. from Eu. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Philadelphia, *James;* Northampton; Lancaster; Centre, *Boecking;* Clinton, *McMinn.*

131. POA SYLVESTRIS, Gray.—Rare and local.—Bucks, *Garber;* Wayne, *Garber;* Chester, at Valley Forge, *Diffenbaugh;* Lancaster.

132. POA DEBILIS, Torr.—Very rare.—Monroe, *Brinton*, at Naomi Pines, the only known station.

133. POA ALSODES, Gray.—Very rare.—Sullivan, on the Loyalsock, *Chas. E. Smith.*

134. POA FLEXUOSA, Muhl.—Rare and local.—Sullivan, on the Loyalsock, *Chas. E. Smith;* Lackawanna, near Moscow, *Thurston;* Lancaster, Bart and Martic Townships.

135. Poa brevifolia, Muhl.—Not common. On rocky river-banks. Flowers early.— Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks, *H. F. Ruth;* Philadelphia, *Diffenbaugh;* Northampton; Lancaster; Huntingdon.

136. Panicularia Canadensis (Michx.) Kuntze. (*Glyceria Canadensis*, Trin.).—Frequent in the swamps of the mountain-regions.—Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Lancaster; Schuylkill; Monroe; Centre.

137. Panicularia obtusa (Nutt.) Kuntze.—Rare and local.—Clearfield, *McMinn;* Monroe, near Tobyhanna Mills.

138. Panicularia elongata (Torr.) Kuntze.—Frequent along the mountain-streams of the Alleghenies.—Bucks (Moyer's Cat.); Carbon; Monroe; Franklin; Tioga, *Garber;* Cameron.

139. Panicularia nervata (Willd.) Kuntze.—Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne (Dudley and Thurston's Cat.); Monroe; Lancaster; Tioga, *Garber;* Huntingdon, *Lowrie.*

140. Panicularia pallida (Eddy) Kuntze.—Rare and local.—Philadelphia, *Dr. Jos. Leidy:* Bucks, *Fretz;* Monroe; Wayne, *Garber.*

141. Panicularia Americana (Torr.) MacMillan.—(*Glyceria arundinacea*, Kunth).—Not common.—Lancaster, Bart township; Bucks, *H. F. Ruth;* Northampton; Monroe; Tioga, *Garber;* Huntingdon, *Lowrie;* Clarion, *Garber.*

143. Panicularia fluitans (Linn.) Kuntze.—Frequent in shallow waters throughout the State.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Franklin; Lancaster; Northampton; Huntingdon.

144. Panicularia brevifolia (Muhl.). (*Glyceria acutiflora*, Torr.) Very rare and local.—Bucks (Moyer's Cat.); Huntingdon.

145. Puccinellia distans (Linn.) Parl.—Philadelphia, *Diffenbaugh.* A species of the sea-coast, introduced and spreading from the heaps of ballast.

145. Festuca octoflora, Walt. (*F. tenella*, Willd.).—Not common. In dry soils.—Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Huntingdon, *Lowrie;* Erie, *Garber.*

146. Festuca duriuscula, Linn.—Nat. from Eu. Rare.—Bucks

(Moyer's Cat.); Northampton, *Fiot, Garber;* Chester, *Burk;* Erie, *Garber.*

147. Festuca elatior, Linn.—Nat. from Eu. Common throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Franklin; Northampton; Lancaster; Huntingdon, *Lowrie;* Blair, *Boecking.*

148 Festuca nutans, Spreng.—Frequent throughout. In rocky woods.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Huntingdon, *Lowrie;* Venango, *Garber.*

149. Bromus secalinus, Linn.—Adv. from Eu. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Luzerne and Lackawanna (Dudley and Thurston's Cat.); Northampton; Lancaster; Franklin; Huntingdon, *Lowrie.*

150. Bromus racemosus, Linn.—Adv. from Eu. Common throughout.—Bucks (Moyer's Cat.); Philadelphia; Lancaster; Northampton.

151. Bromus mollis, Linn.—Fug. from Eu. Very rare.—Chester, *Canby.*

152. Bromus Kalmii, Gray.—Rare.—Northampton; Bucks, *Fretz;* Lancaster, *Small;* Huntingdon, *Lowrie;* Venango, *Garber.*

153. Bromus ciliatus, Linn.—Common throughout. In rocky woods.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia, *I. C. Martindale;* Northampton; Lancaster.

154. Bromus purgans, Linn.—Frequent throughout. On banks of streams. Flowers much later than *B. ciliatus.*—Northampton; Huntingdon, *Lowrie.*

155. Bromus sterilis, Linn.—Adv. from Eu. Not common.—Philadelphia, *Canby, Chas. E. Smith;* Northampton, at Easton.

156. Bromus tectorum, Linn—Adv. from Europe.—Rare.—Northampton, streets of Easton.

157. Lolium perenne, Linn.—Nat. from Eu. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia, *Chas. E. Smith;* Bucks (Moyer's Cat.); Northampton; Lancaster; Franklin.

158. Lolium temulentum, Linn.—Adv. from Eu. Very rare.—Philadelphia, *Chas. E. Smith;* Northampton, near Easton.

159. AGROPYRUM REPENS (Linn.) Beauv.—Nat. from Eu. Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Philadelphia; Northampton; Lancaster.

AGROPYRUM VIOLACEUM (Horn.) Lange.—Rare and local.—Huntingdon, in the barrens near Birmingham, *Miss Davis;* Venango, *Garber.*

160. AGROPYRUM CANINUM (Linn.) Rœm. and Sch.).—Very rare and local.—Monroe, near Pocono Summit.

161. HORDEUM JUBATUM, Linn.—Fug. from Eu.—Berks, *Oberly;* Philadelphia, *Diffenbaugh.*

162. ELYMUS VIRGINICUS, Linn.—Frequent throughout.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia (Barton's Fl.); Bucks (Moyer's Fl.); Northampton; Lancaster; Franklin; Blair, *Lowrie.*

163. ELYMUS CANADENSIS, Linn.—Common throughout. On river-banks.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Philadelphia (Barton's Fl.); Bucks (Moyer's Cat.); Northampton; Lancaster; Bedford, *Small.*

164. ELYMUS CANADENSIS, Linn., var. GLAUCIFOLIUS, A. Gray. Frequent on rocky banks and cliffs along rivers.—Northampton; Dauphin.

165. ELYMUS STRIATUS, Willd.—Frequent along the banks of streams. — Delaware (Smith's Cat.); Chester (Fl. Cestrica); Northampton; Franklin; Huntingdon.

166. HYSTRIX PATULA, Mœnch. (*Asprella Hystrix*, Willd.). Frequent throughout the State.—Delaware (Smith's Cat.); Chester (Fl. Cestrica); Bucks (Moyer's Cat.); Northampton; Lancaster; Franklin; Luzerne, *Heller;* Huntingdon, *Lowrie.*

Solidago humilis, Pursh, of the Eastern States, and its Allies.

(PLATES CLIII.–CLV.)

Solidago Virgaurea, L. has long been regarded as native in the higher latitudes of North America, and appears as such in the Flora of Torrey and Gray. In the 5th edition of his Manual, which covers less territory, Dr. Gray admits the species, but restricts it to two varieties, *alpina*, Bigelow, and *humilis* (Pursh).

In the Synoptical Flora Bigelow's variety alone is retained and Pursh's *humilis* restored to specific rank, but with its compass so enlarged as to embrace a number of diverse and ambiguous forms, amongst which are some that cannot be distinguished from European specimens of *S. Virgaurea* on the one hand, and are clearly separated, on the other, from *S. humilis* by their more robust habit, broader leaves and sharp-pointed involucral scales.

A recent study of these perplexing goldenrods in the herbaria of Columbia College, Lafayette College and the Philadelphia Academy of Natural Sciences, and especially in the large collections made during the last two or three years by Messrs. Rand and Redfield on Mount Desert Island, Maine, has led me to dispose of them as follows:

Solidago Virgaurea, L.—In his description of the type of the species De Candolle (Prod. v. 338) writes: "*mire varians, sed veris. in plures species non divellenda et imo varietatibus vix inter se satis diversis conflata*"—words that well express its behavior also on this side of the Atlantic.

Specimens collected at the Willey House, Notch of the White Mountains, N. H., by *Oakes, Pringle, Edwin Faxon* and others, and on Willoughby Mountain, Vt., by *Rusby*, tally with forms brought from the Isle of Wight and Sunningdale, England, by *Dr.* and *Mrs. Britton*, whilst others collected by *Dr. Morong* in the mountains of New Hampshire, and on Mt. Desert Island by Rand and Redfield, are very like the varieties *angustifolia*, Gaud. and *ericetorum*, DC. of the Old World, and in their foliage approach typical *S. humilis* of the New. (Plate CLIII.)

Besides those already recognized, I venture to characterize several more varieties, peculiar to our flora.

Solidago Virgaurea, L., var. RANDII, n. var. More or less glutinous; stems stout, erect, 1–2 ft. high, often dark purple, puberulent, or sometimes glabrate below; radical and lower leaves obovate or oblanceolate, acute, serrate, cauline lanceolate or elliptical-lanceolate, sparingly serrate or entire, glabrous; inflorescence an ample branched panicle or loose virgate thyrse; heads 3 lines or more long; outer scales of the involucre mostly ovate or lance-ovate and bluntish, sometimes almost linear and acute, inner ones oblong-linear, yellowish, with scarious margins and acute or acuminate tips; achenes pubescent or nearly smooth.—Named in honor of Mr. Edward L. Rand.

Rather common on the mountains of Northern New England and New York; abundant on Mt. Desert Island, Me., *Rand* and *Redfield;* shores of Lake Champlain, Vt., *Pringle.* Passes gradually into the next.

Solidago Virgaurea, L., var. *monticola*. (*S. puberula*, Nutt., var. *monticola*, Porter, BULLETIN xix. 129.)

Stems 3 to 12 inches high, often slender; inflorescence a short, compact or sometimes loose thryse, 2 to 4 inches long; heads 1½ to 3 lines long; scales of the involucre variable, ovate and bluntish or oblong and obtuse, inner ones not elongated.

Common on the highest points of Mt. Desert Island, *Rand* and *Redfield;* Mt. Kineo, Me., *Porter;* summit of Mt. Monadnock (el. 3169 ft.), *Deane;* Willoughby Mountain, Vt., *Rusby.*

Solidago Virgaurea, L., var. REDFIELDII, n. var.—Very glutinous. Stems stout snd rigid, 16–18 inches high; leaves thickish or coriaceous; branches of the panicle starting from half way down the stem or even from the base, strict, erect, bearing short clusters of heads in the upper bracts; heads small, 2–3 lines long; scales of the involucre short, more or less scarious. Its inflorescence is strikingly like that of *S. juncea*, Ait., var. *ramosa*, Porter and Britton.—Named in honor of *Mr. John H. Redfield.*

Western Mt. and Frenchman Camp Road, Mt. Desert Island, Me., *Rand and Redfield;* Summit Rock, Indian Pass, Adirondacks, N. Y. (el. 2600 ft.), *Dr. Britton.*

Solidago Virgaurea, L., var. GILMANII (A. Gray).

Solidago humilis, Pursh.—Stems slender, strict, minutely puberulent above, 4–18 inches high, the dwarf and taller ones growing together and often from the same roots, leafy; radical and lower leaves narrowly oblanceolate, and attenuated downward into slightly-margined petioles, serrulate above the middle, cauline ones lance-linear, entire, acute, glabrous; inflorescence glutinous, in the dwarf forms a short raceme, in the taller ones a loose or compact, virgate thyrse 5–8 inches long; heads 3–4½ lines high; scales of the involucre oblong-linear, obtuse, or the inner ones acutish, sometimes golden-yellow; achenes pubescent. (Plate CLV.)

On the rocky shores of rivers. Onion River, Vermont, *Rob-*

bins, Oakes; McCall's Ferry, on the Susquehanna, York Co., Pa., *Porter;* Great Falls of the Potomac, *Vasey.*

This is the type of the species according to Dr. Gray, and it agrees with the description in Pursh's Flora. In Northern New England and New York, and further northward and westward, in the Rocky Mountains and beyond, occur forms with broader leaves, smaller heads of flowers and shorter and more obtuse involucral scales, which have been placed under *S. humilis.* But they vary much, and their relations to the type must be left to future investigation.

The variety *microcaphala*, Porter (BULLETIN xix. 129), which was founded on a single specimen, proves to be on closer inspection a remarkable form of *S. nemoralis*, Ait.

Solidago alpestris, Wald. and Kit. (*S. Virgaurea*, L., var. *alpestris* (Koch), L. and var. *alpina*, Bigelow).—Alpine; stem glabrous or somewhat pubescent, 3–10 inches high, in the larger forms often bent, angular; radical leaves obovate, appressed-serrate above the middle, obtuse or acute, cauline oblanceolate or spatulate, of equal size, or 2 or 3 of the uppermost larger, longer and spreading, narrowed toward the base, obtuse or acute, sparingly serrate, distant; inflorescence a short raceme or thyrse with clusters of a few heads in the axils of the long upper leaves; heads 3–4 lines high; scales of the involucre acute; rays variable in length and breadth; achenes pubescent. (Plate CLIV.)

Summits of Mt. Katahdin, Me., the White Mountains, N. H., and Mt. Marcy (5300 ft.) and Mt. McIntyre (5100 ft.), N. Y.

At the highest elevations dwarfing obscures some of its characters, but the abundance of fine specimens obtained last summer by Dr. Britton in the Adirondacks exhibits the species in its fullest development, and on comparing them with *S. alpestris* from the Swiss and Carpathian Alps of Europe and the Altai Mountains of Asia the differences are so slight that the two must be regarded as identical. And such a conclusion ought to cause no surprise, when we consider the notable company of Old World alpines which occupy the same mountain-tops. This only adds one more to the number. From the polymorphous *S. Virgaurea* of Linnæus, spread over Europe at lower altitudes, the divergence is so wide that it may well be counted a good species. Koch himself was inclined to think so, as appears from his remark in the Flora Germanica (p. 341): "*Varietates hic enumeratæ plures, ut mihi videtur, species constituunt, sed hucusque nondum satis observatæ sunt.*"

Dr. Gray was inclined to connect our plant with the other European alpine variety, *Cambrica*, but that has oblong-lanceolate leaves which are pilose on both sides. THOS. C. PORTER.

Francis Wolle.

After a painful and protracted illness, Rev. Francis Wolle died at his home in Bethlehem, Pa., February 10th.

He was born at Jacobsburg, Northampton Co., Pa., December 17, 1817. His ancestors, for two generations, were conspicuously associated with the Moravian Society, and during his long and useful life he was always prominent in Moravian church and educational affairs. Although a few of his earlier years were spent in business, he soon turned his attention to teaching as his life-work, and in 1857 he became vice principal of the celebrated Moravian Seminary for Young Ladies at Bethlehem, Pa. In 1861 he became principal of the institution, and conducted its affairs with marked ability until 1881, when the increasing infirmities of age necessitated his seeking rest.

From his childhood the study of natural history was his favorite pursuit, and after his retirement from active professional work, in 1881, he devoted himself to it with more ardor than ever. He was especially known among botanists as an authority upon fresh-water algæ and desmids. In 1884 he published his "Desmids of the United States and list of Pediastrums." The volume contained 1100 illustrations on 53 colored plates. This was followed in 1887 by two volumes on "The Fresh-Water Algæ of the United States, complemental to Desmids of the United States." This work was illustrated by 117 colored plates, embracing 2300 figures. In 1891 he brought out a work upon the "Diatomaceæ of the United States." This contained 2300 figures on 120 plates. All of the illustrations enumerated were photo-lithographs from India ink sketches made by the author. During 1892 there appeared a revised and enlarged edition of the "Desmids of the United States."

His contributions to cryptogamic botany are recognized by scientists at home and abroad as standard works of great value. The particular field of his investigations had previously been but little worked, but his labors have stimulated research in these very attractive by-paths of science. He will long be remembered by those who were his friends and correspondents, for his kindliness of heart, as well as for his conscientious care in the department of science to which he devoted the energies of his later years.

C. H. Kain.

A Simple Point in Nomenclature.

In these later days it may be said that the "air is filled" with discussions on this perplexing subject, and we have all sorts of suggested reforms looking toward the ultimate stability of our plant-names. The Committee appointed by the American Association will undoubtedly give us a valuable set of working rules at the approaching Madison meeting, but while they are concerning themselves with the weightier problems, I take the liberty of calling to their attention a very small point upon which it would perhaps be well to have an authoritative ruling. This question is: When it is desired to question either of the members of a plant-name, where shall the question mark be placed? This seems a very trivial question, but, judging from the variation in its use, it is not properly appreciated.

Suppose for example that a botanist is working up a collection of plants and finds one which seems to be *Ranunculus aquatilis*, L., but the material is not sufficient to be positive. In a printed enumeration how will this doubt be expressed? The following forms [given as models] have all been abundantly observed: ? *Ranunculus aquatilis*, L.; *Ranunculus* ? *aquatilis*, L.; *Ranunculus aquatilis*? L.; *Ranunculus aquatilis*, L.?, with the further variation of placing them all in brackets.

If, as is ordinarily understood, the interrogation mark questions the word which it follows, we shall clearly have a state of affairs not only contradictory but not contemplated in many cases. In a great majority of instances it is probable that the intention is to question the species, but such indiscriminate use of the question mark can only lead to confusion, when it is remembered that there are at least three separate and distinct things which it is sometimes desirable to question. These are the genus, the species, and the authority. If it was always understood that the mark cast doubt upon the word which it immediately followed, it could be used with an exactness which it does not now admit of. Is it not worth while for the committee to formulate a rule which will embody the above facts? F. H. KNOWLTON.

U. S. NATIONAL MUSEUM, March 25, 1893.

[It would seem that the interrogation mark placed as in the first and fourth of Mr. Sudworth's models should indicate that the author is in doubt whether he is or is not referring to the *Ranunculus aquatilis* of Linnæus; placed as in the second model would indicate that doubt is thrown on *Ranunculus aquatilis* belonging in the genus *Ranunculus*, and would ordinarily only be employed in the first description of a plant. We see no particular application for the third method.—ED.]

Further Notes on American Species of Polygonum.

BY JOHN K. SMALL.

(PLATE CLVI.)

Since the publication of my Preliminary List of American Species of *Polygonum* in the BULLETIN of December, 1892, I have had an opportunity to examine and study, among other collections, those of the Geological and Natural History Survey of Canada and the California Academy of Sciences. The former is rich in specimens from the territory north of the United States, and the latter is remarkably well stocked with rare and interesting Western material, as well as some of the very scarce species from the Andes of South America.

The following notes and descriptions of new forms are the result of some observations on the different species recorded below. I also take occasion in this place to ask collectors, in whatever part of the country they may be, to gather all the forms of the genus under consideration that they may meet with during the coming season.

POLYGONUM SAWATCHENSE, n. sp. Annual; more or less scurfy or papillose throughout, of a dull green color; stem erect, striate, obscurely four-angled and four-winged below the ocreæ, branched from the base, .6–1.5 dm. tall; leaves narrowly obovate below, almost linear above, .5–2 cm. long; .1–.4 cm. broad, sessile, with conspicuous articulations at the junctions with the ocreæ, acute at the apex, acuminate at the base, strongly revolute, much the same length even to the summit of the stem; mid-rib very prominent beneath and generally wing-like; ocreæ funnel-form, lacerate to about the middle; inflorescence of axillary clusters extending to the very base of the stem, and bearing from one to four flowers; flowers rather large; calyx five-parted, green, only slightly lighter on the borders; style very short, three-parted, the divisions hardly perceptible; achene triquetrous, oblong, rather blunt at both ends, smooth and very glossy.

A well marked species of the Avicularia section collected by Brandegee on the Sawatch Range, Colorado. The specimens are in the Herbarium of the California Academy of Sciences.

POLYGONUM PUNCTATUM, Ell., var. ECILIATUM, n. var. More robust than the species, less scurfy throughout, erect, much branched; leaves lanceolate to oblong-lanceolate, rather broad, less punctate than the normal form; ocreæ cylindric, loose, long, strictly entire and free from bristles; the narrow racemes, as well as the upper parts of the pedicels, dark reddish-purple; achene broadly oblong, finely but plainly reticulated.

Differs from the species principally in its glossy appearance, owing to the absence of the usual scurfy surface, perfectly smooth and eciliate ocreæ, and the slightly narrower and more reticulated achene. The color of the flowers and racemes, though of less consequence, is very striking.

Collected by Mr. Pringle in wet places, Valley of Toluca in the State of Mexico. No. 4213.

POLYGONUM PERSICARIOIDES, H. B. K. This sub-tropical species heretofore so imperfectly known, has been discovered in Lower California, by Mr. Brandegee, at two localities, namely, San Jose del Cabo and Sierra de San Francisquito. It ought to be found in Southern California and the States to the east.

Mr. Pringle, in his last Mexican journey, encountered a peculiar form of this species. The stems are several from an oblique root-stalk, simple or nearly so, leaves shorter, broader and less acute than in the normal form, and the narrow racemes fewer flowered. The habitat is given as wet meadows, Valley of Toluca, State of Mexico, No. 4218.

POLYGONUM HYDROPIPEROIDES, Michx., var. STRIGOSUM, Small. Very common in slow streams, swamps, etc., in the San Bernardino Valley, California, according to Mr. S. B. Parish, who has collected fine specimens and records its flowering season as October and November. Mr. J. W. Congdon has also gathered it at Visalia, Tulare county, California, which is some distance north of the San Bernardino Valley. The variety holds its character in every respect.

As we have it now from different points east of the Mississippi River and from two localities near the Pacific coast, we may expect it to be found in the future at intermediate places.

P. hydropiperoides, as well as the variety *strigosum*, has an almost invariable character which, it seems, has never been recorded. The stem or branches always produce, at the distance of three-fourths of an inch or less above the angle of branching, a node with a leaf and ocrea, thus making an internode several times shorter than normal length.

POLYGONUM LITTORALE, Link. Although this species has found no place in the text-books or other botanies of our country it is not uncommon. Usually, it has been confounded with either *P. erectum* or *P. aviculare*, neither of which it resembles so closely as to render such a confusion excusable. The examination of material, in different herbaria, under the above mentioned names will doubtless show that the species is not rare. I find a number of botanists, feeling that no allowence was made for this form, have left it unnamed in their collections. *P. littorale* is more woody than *P. erectum* and *P. aviculare*. It spreads out extensively, one plant often covering several square yards. Its achene is much broader and less pointed, and also of a darker color (almost black), less reticulated and more shining than that of *P. aviculare*. Specimens in the Herbarium of the Geological Survey of Canada give us a considerable Northern extension of the range, Macoun having found it in British America at Silver City, on the Rocky Mountains, and on open praries near Walsh, N. W. T.

POLYGONUM RAYI, Babington. For the present we will have to consider this as an introduced and naturalized plant. But as it is appearing from so many and widely separated localities it may yet prove to be native. It grows plentifully on the coasts of Europe in company with *P. maritimum*, with which it has always been confounded here. *P. maritimum* is common to both Europe and America, and there is no reason why *P. Rayi* should not be also. It is true that this species is closely related to *P. maritimum*, but it can readily be distinguished by the more acute achene which protrudes farther beyond the calyx, by the longer internodes, the flat and fewer veined leaves, and the few veined ocreæ. The whole plant is also less glaucous. We now have it well represented in British America, as the following stations will indicate: sea beaches, Brackley Point, Prince Edward Island (Macoun); sandy beaches, Bass River, N. B. (Fowler); Jupiter River, Anticosti, P. Q. (Macoun). The most interesting locality is Qualicum, Vancouver Island (Macoun).

Polygonum Austinæ, Greene. The range of this once obscure species is gradually being brought to light. Some time after its discovery on the sage-brush plains in Northern California by Mrs. Austin, the plant was picked up by the U. S. Geological Surveys in the Yellowstone Park, Wyoming. This specimen found its way to the National Herbarium at Washington and remained there undetermined. I now find that the species was discovered in British America by Dawson at South Kootanie Pass, on the Rocky Mountains, one year previous to its collection in California. This specimen is preserved in the Herbarium of the Geological Survey of Canada, having been erroneously determined as *P. tenue*, var. *latifolium*. *P. Austinæ* is a remarkably clear species, holding the characters given to it originally by Prof. Greene (Bull. Cal. Acad. Sci. i. 212), with one minor exception. I find that often the achene at maturity slightly surpasses the calyx.

Polygonum Kelloggii, Greene. Before my preliminary paper on the genus was printed I had not seen Prof. Greene's type nor a specimen of what he referred to his new species. Being thus unable to tell exactly what he included under *P. Kelloggii*, I temporarily placed all forms related to *P. imbricatum* under that species. As I have lately become fully acquainted with this plant I can now map out the following geographical range for it—Washington; Shamania County (Suksdorf): California; Modoc county (Mrs. Austin), Lake County, Snow mountains (Brandegee), Donner Lake, Mariposa County, Yosemite

(Bolander), Placer County (Carpenter): Utah; Parley's Park, 6500 ft. (Watson, 1062 in part), Alta Wahsatch mountains 10,000 ft. (Jones, 1105): Colorado: Bear Creek valley, near Empire, 10,000 ft. (Patterson).

Thomas Hogg.

Mr. Thomas Hogg, an active and highly esteemed member of the Torrey Botanical Club, died suddenly of angina pectoris, on the 30th of December, 1892. He was born in London, February 6, 1820, and came to this country with his father, Thomas Hogg, Senior, when only 9 months old. From his earliest years his natural taste for the study of plants and horticultural pursuits was fostered by his surroundings. His father was long engaged in the management of gardens and greenhouse culture before leaving England, and was all his life afterwards a successful nurseryman and florist in the city of New York. In this business he was assisted by Thomas Hogg, Junior, and his brother James, who took charge of his establishment at his death in 1855, and for many years subsequently conducted the business on their own account.

Mr. Hogg was made United States Marshal in the year 1862, and in that capacity paid a visit to Japan, in which country he remained eight years. At the end of that period he resigned his office and returned home. Shortly after, however, he was invited by the Japanese Government to return to the Island and take office in the Custom House, which he did, spending two years more in that service. During his long sojourn in Japan, he spent much time in travelling over the Islands and studying their flora, his official position giving him unusual facilities for exploration and collection. He made a large collection of Japanese trees, shrubs and herbaceous plants, such as he thought adapted to culture in our country. These he shipped to New York, many of them subsequently finding their way to England. Among those which proved to be adapted to our climate, are many of the choicest Japanese plants which ornament our gardens to-day, which he was the first to introduce.

In this manner Mr. Hogg acquired that familiarity with horticulture for which he was noted, and about which his advice was often sought. He was a diligent reader of horticultural publications, and frequently contributed articles of interest to our garden periodicals, keeping almost to the last day of his life well informed as to all the movements in floriculture in all parts of the world.

After withdrawing from business, Mr. Hogg led a retired life, but lost none of his love for his favorite studies, for his leisure was spent in botanical and other scientific investigations. Much of his time was spent in visiting various libraries and florists' establishments in this city, and on several occasions he went abroad and visited the most celebrated botanical gardens in Europe. His last years were much broken by ill health caused by an attack of the influenza in Paris some two years since, from the effects of which he never fully recovered.

In manner Mr. Hogg was grave, dignified and reserved, but he was invariably cheerful, and genial and kindly in spirit. Among congenial companions his conversation was sprightly, and often strikingly original and interesting, but his modesty was so great that few except such companions ever learned how rich were his stores of knowledge, not only upon his favorite subjects, but also upon a wide range of other topics. His conversation sparkled with humorous anecdotes and shrewd observations upon the various people and scenes which he had encountered in the course of his long life.

Mr. Hogg was admitted to membership in the Torrey Botanical Club in 1882. In 1886 he was elected Vice President of the Club, and chosen annually to the same office until the time of his death, except during the year 1891, when he was absent in Europe. He was seldom absent from the meetings when at home, and frequently participated actively in the proceedings and discussions, greatly contributing to the interest of the occasion by his pertinent and entertaining remarks. THOMAS MORONG.

Death of Dr. George Vasey.

Dr. George Vasey, Botanist of the United States Department of Agriculture and Honorary Curator of the National Herbarium, died at his home in Washington, March 4, 1893, after an illness of only a few days duration, of acute peritonitis. He had been absent from his office but four days, and the news of his death came with almost equal suddenness to those at a distance from Washington and those intimately associated with him in his work.

At the request of Dr. Vasey's family, his friend Mr. William M. Canby has undertaken the preparation of a biographical memoir, to contain a more extended account of Dr. Vasey's life, work, and publications; and to him have been intrusted the data requisite for its compilation. It is necessary here, therefore, to give only an outline of his career.

George Vasey was born near Scarborough, England, February 28, 1822, of English parents; and in the following year was brought by them to America. His boyhood was spent in Central New York, where from his acquaintance with Dr. P. D. Knieskern, of Oriskany, he became interested at the early age of sixteen years in the study of the local flora. In 1847 he received the degree of Doctor of Medicine at Pittsfield, Massachusetts, and from 1848 to 1868 was engaged in the practice of his profession, residing during the principal part of that period in Northern Illinois.

As this point in Dr. Vasey's life his botanical knowledge, which had previously been held subsidiary to his profession of medicine, took upon itself a new character. In 1868 he accompanied Major J. W. Powell, in the position of botanist, on an exploring expedition to Colorado. A second similar expedition to the same region followed during the next year; in 1870 he was placed in charge of the Museum of the Illinois Natural History Society at Bloomington; and in 1872 he was called to Washington as Botanist of the United States Department of Agriculture. From this time until his death his efforts were devoted earnestly and unremittingly to his work, new as a profession, but old as a cherished pursuit.

The age of fifty seems late for the beginning of a scientific career. Up to that time Dr. Vasey had published only a few unimportant notes, but his preparation had been long, faithful, and opportune. He now began to publish papers one by one, at first on the subject of trees, afterward principally devoted to the Gramineæ. His activity seemed to increase with his age, and during the last year of his life he probably produced more matter for publication than during any earlier period of equal length. The second part of the "Grasses of the Pacific Slope" was already in the printer's hands at the time of his death, and the manuscript for the concluding brochure of his "Monograph of the Grasses of the United States" was so near completion that it can be edited according to its author's plan.

Dr. Vasey's principal publications are too well known to require comment here, but we cannot omit a reference to the greatest and most lasting monument to his memory, the National Herbarium. To building up this great collection he devoted his most faithful energies, and the future student of American botany will give him well deserved honor for this bounteous legacy.

FREDERICK VERNON COVILLE.

Reviews of Foreign Literature.

Les Maladies Cryptogamiques des Cereales. Par J. Loverdo, Paris, 1892. This work of 300 pages and 35 figures, treats of the fungi parasitic upon wheat, rye, maize, barley, oats, sorghum, millet, rice and buckwheat, and under each species, the enemy, in the order of history, exterior characters, botanical aspect, condition of development, effect of the disease, and means of defense. Under bacteria, *Bacillus Sorghi*, Burl., is treated at length with figures after Kellerman. The Ustilagineæ are largely considered on pages 40 to 145, ten of the *Ustilagos* proper receiving treatment, three *Tiletias* and *Urocystis occulta.* The chapter upon the penetration of the ustilago germ is an interesting review of the modern view established by DeBary, Brefeld and others with its important economic bearings. Less space is given to the Uredineæ than the smuts, only *Puccinia graminis*, *P. rubigo-vera*, *P. coronata*, *P. Sorghi* and *P. purpurea* being given in particular. The figures are not of the best, those after DeBary and Cavara being much better than those d'apres nature. The Ascomycetes brought to the front are *Erysiphe graminis*, *Sphærella exitralis*, and, of course, the Ergot (*Claviceps purpurea*), over thirty pages being given to this with several of Tulasne's cuts. A few pages are devoted to the imperfect forms of *Helminthosporiums* and *Septorias.* The practical vegetable pathologist can find in this work much to interest him at very small expense. B. D. H.

On the Genus Myeloxylon, Brong. A. C Seward. (Ann. Bot. vii. 1–20. Pl. 1, 2.) The author gives the results obtained from a

microscopic examination of specimens of *Myeloxylon* from the Millstone Grit of the British Carboniferous. Similar or identical wood from other localities have been classed at different times as a palm, a fern and a cycad and have been described under the generic names *Palmacites*, *Myelopteris*, *Medullosa*, *Stenzelia*. The author's conclusions are that the true position of *Myeloxylon* is intermediate between the ferns and cycads, but most closely allied to the latter.
A. H.

Proceedings of the Club.

TUESDAY EVENING, APRIL 11TH, 1893.

Vice-President Morong in the chair and 27 persons present.

The following members were appointed to serve as the Field Committee for the season of 1893:

Dr. Thos. Morong, Mr. Henry Kraemer, Rev. Geo. D. Hulst, Dr. Jeannette B. Greene, Miss L. R. Heller.

Dr. H. H. Rusby and Dr. Thos. Morong were appointed delegates to the Council of the Scientific Alliance of New York for the year May, 1893—May, 1894, to serve with the President of the Club.

The following persons were elected Active Members:

Miss Susan Travers, Riverdale, New York City; Mr. Samuel Henshaw, West Brighton, Staten Island, New York; Mr. Henry A. Siebrecht, New Rochelle, New York; Prof. Fred. W. Seringhaus, 954 Eighth Ave., New York City.

The following papers were then presented.

By Prof. Byron D. Halsted, "Some Results with Fungicides," illustrated by lantern slides.

By Mr. John K. Small "Further Notes on American Species of *Polygonum*," illustrated by specimens. The paper is published in this number of the BULLETIN.

By Mr. A. A. Heller, "The United States Department of Agriculture Expedition to Idaho in 1892," illustrated by specimens and a map.

Dr. Thos. C. Porter described his collection of the Grasses of Pennsylvania, made for the Pennsylvania State Agricultural Society, for exhibition at the World's Columbian Exhibition at Chicago. A list of these Grasses, giving their distribution in the State is printed in this number of the BULLETIN.

Dr. Britton exhibited a specimen of the base of a Horse Chestnut tree, *Æsculus Hippocastanum*, obtained by Mr. Walter C. Kerr at Tompkinsville, Staten Island, and first described at a recent meeting of the Natural Science Association of Staten Island. The specimen showed a remarkable development of adventitious buds arising from the cambium, the wood having almost entirely decayed away. There are more than 100 of these buds on the specimen which is about one foot high and ten inches wide. The length of some of the shoots indicates that these buds have been forming for at least two years.

Dr. Britton announced the death in Geneva, Switzerland, of M. Alphonse DeCandolle, an Honorary Member of the Club, and one of the most eminent botanists of the century. He alluded to M. DeCandolle's invaluable scientific work and moved the appointment of a committee to draw up a suitable minute for record in the proceedings of the Club and for transmission to his son, M. Casimir DeCandolle. The motion was seconded and carried. The Chairman appointed Dr. Britton and Dr. Rusby as such Committee.

Dr. Morong distributed copies of the circular of the Instruction Committee, giving the programme for the summer course in Botany carried on by the Committee in coöperation with the College of Pharmacy of the City of New York.

TUESDAY EVENING, APRIL 25TH, 1893.

Vice-President Morong in the chair and 43 persons present.

The meeting was held on this evening instead of the following in order to give members of the Club opportunity to participate in the ceremonies attending the unveiling of the monument to John James Audubon, at the American Museum of Natural History, which were conducted on Wednesday evening, April 26.

Dr. Morong presented a report for the committee appointed to prepare a statement regarding the death of Mr. Thos. Hogg. This statement will be found upon another page of the BULLETIN.

Mr. Cornelius Van Brunt presented the announced paper of the evening on "Botany and Photography." The paper reported the result of an extended series of experiments in photographing plants in flower, and was illustrated by a large number of lantern slides, from which it was evident that the experiments had been highly successful. Many of the slides had been colored by Mrs. Van Brunt, and the accuracy and delicacy of the coloring was much admired.

Index to Recent Literature Relating to American Botany.

Acarocecidien und Acarodomatien—Einige neue. G. de Lagerheirm (Ber. Deutsch. Bot. Gesell. x. 611–619).

Bacteria in the Dairy. H. W. Conn (5th Ann. Rep. Storrs School Agric. Exp. Sta. 106–126).

Cæsalpinia—The Genus. E. M. Fisher (Bot. Gaz. xviii. 121–123).

Mr. Fisher has followed up the suggestion made in the BULLETIN, vol. xix. p. 345, that the species of *Hoffmanseggia*, so critically described by him (Contr. Nat. Herb. i. No. 5), should be referred to *Cæsalpinia*, and now transfers them all to this genus.

Contributions to the Life Histories of Plants. No. VIII. Thomas Meehan (Proc. Acad. Nat. Sci. Phila. 1892, 366–386).

This paper consists of observations on the following subjects: *Euphrasia officinalis;* Notes on *Gaura* and *Œnothera:* The Carpellary Structure of *Nymphæa;* On the Sexual Characters of *Rhus; Rubus Chamæmorus; Dalibarda repens*; On some Morphological Distinctions in the Genera of Ericaceæ; Vitality of Seeds, *Lysimachia atropurpurea: Campanula rotundifolia ; Cornus Canadensis; Aralia hispida; Luzula campestris; Cakile Americana; Hypericum ellipticum; Trifolium hybridum; Lathyrus maritimus; Lonicera cærulea; Raphanus sativus;* On the Nature of the Verrucæ in some Convolvulaceæ; *Polygonum cilinode; Aster Tatarica.*

Contributions to Western Botany, No. 3. Marcus E. Jones (Zoe. iii. 283–309).

Notes on a large number the species, the following described as new: *Lepidium heterophyllum; Astragalus diphysus*, var. *latus; A. Beckwithii*, var. *purpureus; A. Dodgianus; A. Ibapensis; A. Peabodianus; A. Toanus; A. atratus*, var. *stenophyllus; Cymopterus Ibapensis*, and *Primula Broadheadæ.*

Diatomaceæ of Minnesota, Inter-Glacial Peat. Benj. W. Thomas (Geol. and Nat. Hist. Surv. Minn. Twentieth Ann. Rept. (1891), 290–320).

The discovery of diatoms in a peat bed, in Blue Earth county, Minn., interbedded between glacial clays, is described and about 100 species are listed. They are all fresh water, and with few exceptions, living species. The clays above and below the peat are of marine origin. The list is the work of H. L. Smith, and accompanying it are a series of critical notes, which are of great value for reference and comparison. A chapter upon methods of preparation, by Dr. C. Johnston, is also appended. A. H.

Fungi common in 1892 in Iowa. L. H. Pammel (Agric. Sci. January, 1893).

A long list arranged under the several orders of the most destructive fungi of last year in Central Iowa.

Fungus—A Parasitic (*Heterosporium asperatum*). Geo. Massee (Am. Jour. Mic. February, 1893).

This treats of the *Heterosporium* as parasitic upon *Smilacina stellata*, accompanied by a full page plate, giving details of the structure of the fungus.

Grasses—Some Diseases of. W. C. Stevens (Kan. Univ. Quart. January, 1893).

The grass fungus parasites with regard to their effects are grouped: (1) as those destructive to host tissues, *Puccinias* as examples; (2) those producing abnormal growths, corn smut as illustration; (3) destroying the chlorophyll, and (4) those attacking the ovaries, as the ergots. Three microphotograph plates illustrate the points made.

Leguminosengattungen—Zur Kenntniss einige. P. Taubert (Ber. Deutsch. Bot. Gesell. x. 637–642).

The genus *Garugandra*, Griseb, found on a tree of the Argentine Republic and Bolivia, is referred to *Gleditschia* and figured.

Myxomycetes of the Miami Valley. A. P. Morgan (Jour. Cincinnati Soc. Nat. Hist. xv., Nos. 3–4).

This is the first of a series of papers; characterizes the group; lists the species with descriptions under two orders, namely: Liceaceæ and Reticulariaceæ and records five new species with figures of them in a single plate.

Phalloid—A New. A. P. Morgan (Jour. Cincinnati Soc. Nat. Hist. xv., Nos. 3 and 4). *Phallogaster* as a new genus is described and under it *Phallogaster saccatus*, Morgan, n. sp. A full page plate is given of the same.

Phyllogaster saccatus—Note on. Roland Thaxter (Bot. Gaz. xviii. 117–121, one plate).

Revision der Kleineren Ranunculaceen-Gattungen Myosurus, Trautvetteria, Hamadryas, Glaucidium, Hydrastis, Eranthis, Coptis, Anemonopsis, Actæa, Cimicifuga and Xanthorrhiza.—E. Huth (Engler's Bot. Jahrb. xvi. 278–324).

For a critical review of this important paper, we would refer to Prof. Greene in Erythea, i. 70.

Root Tubercles of Indigenous and exotic Legumes in Virgin Soil of Northwest. H. L. Bolley (Agric. Sci. February, 1893).

Twenty-one native species of Leguminosæ are named as bearing tubercles, the character of the soil, usually in Dakota, being given for each host. In like manner sixteen exotic species of the same order are listed as bearing the tubercles. Non-leguminous plants as *Alnus*, *Shepherdia* and *Eleagnus* are mentioned as bearing nodules upon their roots.

Russian Thistle and other Troublesome Weeds in the Wheat Region of Minnesota and South Dakota. L. H. Dewey (U. S. Dept. Agric., Farmer's Bulletin No. 10 pp. 16, two plates).

The "Russian Thistle" or "Russian Cactus" is *Salsola Kali*, L., var. *Tragus*, D. C., closely related to the saltwort of the seabeaches, and thus neither a thistle nor a cactus. It has long been a pernicious weed in the wheat regions of Russia and became introduced into those of our Northwest about fifteen years ago. It has now spread over some 30,000 square miles and is the cause of much financial loss and endless trouble.

Salix balsamifera. Edward L. Rand (Garden and Forest, vi. 105).

Schneeflora des Pichincha. Ein Beitrag zur Kenntniss der Nivalen Algen und Pilze. G. de Lagerheim (Ber. Deutsch. Bot. Gesell. x. 517–534, one plate).

Description of new species in the genera *Chlamydomonas*, *Raphidonema*, and of a new genus, *Selenotilla*, with a list other plants of low organization from the snows of this Equador mountain peak.

Sereno Watson. George Lincoln Goodale (Proc. Amer. Acad. Arts and Sci. xxvii. 403–416).

A biographical notice with portrait and a list of Dr. Watson's published papers.

Slime-molds and Club-root. A. B. Seymour (American Gardening, xiv. 160).

Some Bean Diseases. S. A. Beach (A thesis in the Botanical Department of Iowa Agric. College for the master's degree).

This is an extensive paper upon the Bean Pod Spot (*Colletotrichum Lindemuthianum* (S. & M.) B. & C)., giving the distribution and character of the disease and its appearance upon pods, leaves, seed and seedlings. Field experiments were made with fungicides, and comparisons of results are given in the chapter closing with a bibliography of the subject.

Brief mention is added of a bacterial bean blight and of the Bean Rust (*Uromyces Phaseoli* (Pers.) Wint). Six full page plates are given. The same matter appears as Bull. 48 of the Geneva, N. Y., Exp. Station pp. 305–333. B. D. H.

Stuartia.—Geo. Nicholson (Garden, xliii. 172). With a figure of *Stuartia Virginica.*

The New Botany. Lester F. Ward (Science, xxi. 43, 44).

This article is in the nature of a plea for the more systematic study of plant affinities rather than plant differences. The author urges the necessity for the study of fossil plants in order that we may understand the ancestry of our living plants and how these came to be what we now find them. The mere determination of plants, either living or fossil, is of course necessary, but in order to appreciate fully what these determinations mean, a close study of their affinities is necessary, and this can only be done by a close comparison of living and fossil forms. A. H.

Contributions from the Herbarium of Columbia College.

No. 1. A Preliminary List of North American Species of *Cyperus*, with Descriptions of New Forms. By N. L. Britton (1886), ... **25 cents.**

No. 2. *Cerastium arvense*, L., and its North American Varieties. By Arthur Hollick and N. L. Britton (1887). (Out of print.)

No. 3. Plant Notes from Temiscouata County, Canada. By J. I. Northrop (1887). (Out of print.)

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... **25 cents.**

No. 5. New or Noteworthy North American Phanerogams. By N. L. Britton (1888), ... **25 cents.**

No. 6. An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1886–1887. By N. L. Britton. (Twenty-three parts published; not yet completed.)

No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . . . **25 cents.**

No. 8. A Recent Discovery of Hybrid Oaks on Staten Island. By Arthur Hollick (1888), ... **25 cents.**

No. 9. A List of Plants Collected by Dr. E. A. Mearns at Fort Verde and in the Mogollon and San Francisco Mountains, Arizona, 1884–1888. By N. L. Britton.

The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), ... **25 cents.**

No. 10. Contributions to American Bryology—An Enumeration of the Mosses Collected by Mr. John B. Leiberg in Kootenai County, Idaho. By Elizabeth G. Britton. (Out of print.)

No. 11. Preliminary Notes on the North American Species of the Genus *Tissa*, Adans. By N. L. Britton (1889), ... **25 cents.**

No. 12. The Genus *Eleocharis* in North America. By N. L. Britton (1889), **25 cents.**

No. 13. New or Noteworthy North American Phanerogams, II. By N. L. Britton (1889), ... **25 cents.**

No. 14. A List of State and Local Floras of the United States and British America. By N. L. Britton (1890), ... **$1.**

No. 15. A Descriptive List of Species of the Genus *Heuchera*. By Wm. E. Wheelock (1890), ... **25 cents.**

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No. 17. The Flora of the Desert of Atacama. By Thos. Morong (1891), **25 cents.**

No. 18. Contributions to American Bryology, II. A supplementary Enumeration of Mosses collected by Mr. John B. Leiberg in Kootenai County, Idaho. By Elizabeth G. Britton (1891), ... **25 cents.**

No. 19. Notes on North American Halorageæ. By Thos. Morong (1891), . 25 cents.

No. 20. New or Noteworthy North American Phanerogams, IV. By N. L. Britton. (1891), ... 25 cents.

No. 21. Notes on the North American Species of Eriocauleæ. By Thos. Morong (1891), ... 25 cents.

No. 22. New or Noteworthy North American Phanerogams, V. By N. L. Britton (1891), ... 25 cents.

No. 23. The American Species of the Genus *Anemone* and the Genera which have been referred to it. By N. L. Britton (1891), ... 25 cents.

No. 24. Review of the North American Species of the Genus *Xyris*. By Heinrich Ries (1892), ... 25 cents.

No. 25. A Preliminary List of the Species of the Genus *Meibomia* occurring in the United States and British America. By Anna M. Vail (1892), . 25 cents.

No. 26. A List of Species of the Genera *Scirpus* and *Rynchospora* occurring in North America. By N. L. Britton (1892), ... 25 cents.

No. 27. Note on a Collection of Tertiary Fossil Plants from Potosi, Bolivia. By N. L. Britton (1892), ... 25 cents.

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No. 35. An Enumeration of the Plants Collected by Dr. Thos. Morong in Paraguay 1888–1890. By Thomas Morong and N. L. Britton, with the assistance of Miss Anna Murray Vail (1892–1893).. . . . . $1.50.

No. 36. An Examination of the Seeds of some Native Orchids. By Carlton C. Curtiss (1893), ... 25 cents.

No. 37. Further Notes on American Species of *Polygonum*. By John K. Small (1893), ... 25 cents.

The whole series with the exception of Nos. 2, 3, 6 and 10 will be supplied for $5.

Copies of the Catalogue of Plants found in New Jersey (1889), by N. L. Britton, may be had for $2.

Address

DR. THOS. MORONG,
Curator of the Herbarium, Columbia College,
NEW YORK CITY.

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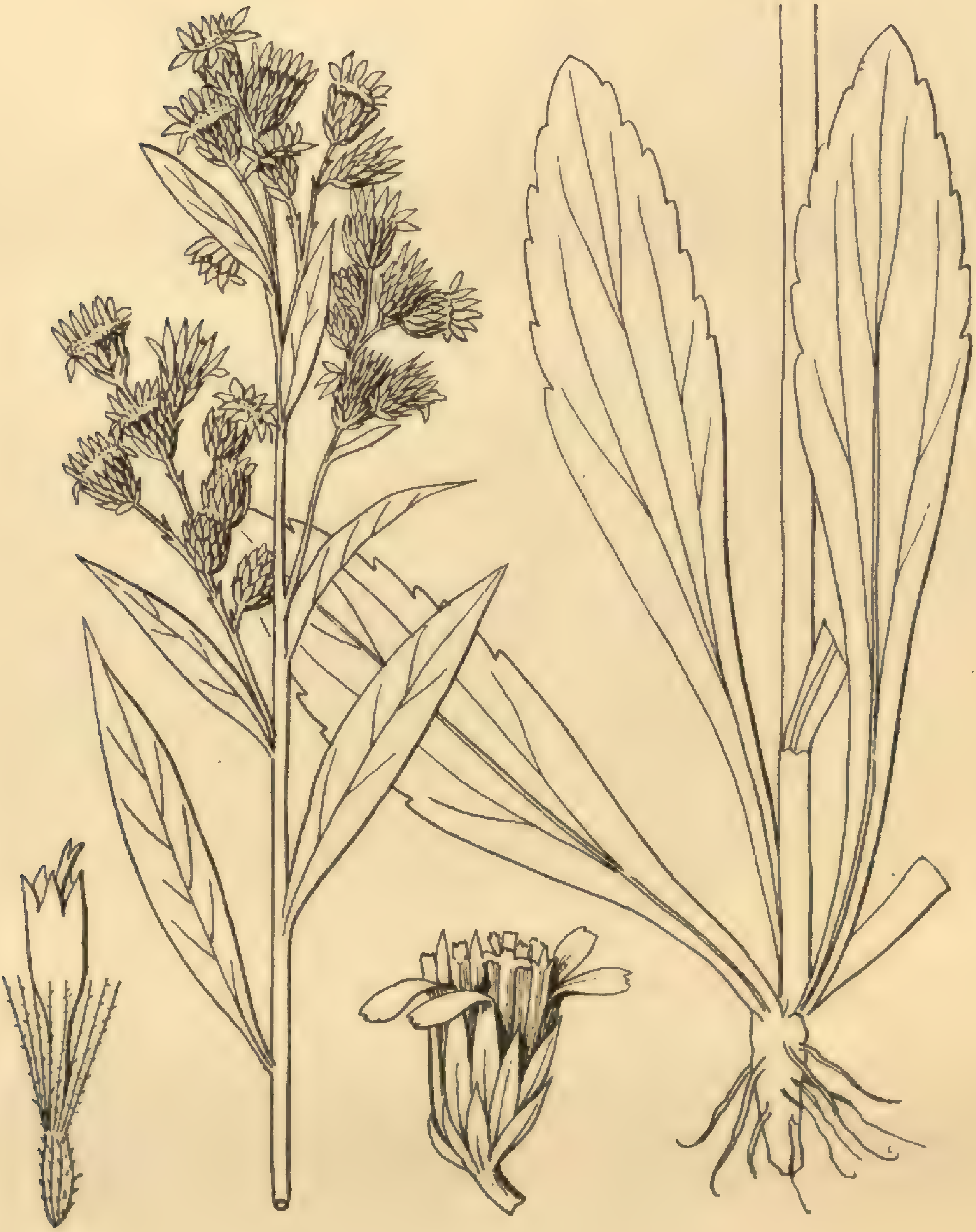
SEEDS OF SOME NATIVE ORCHIDS—C. C. CURTISS.



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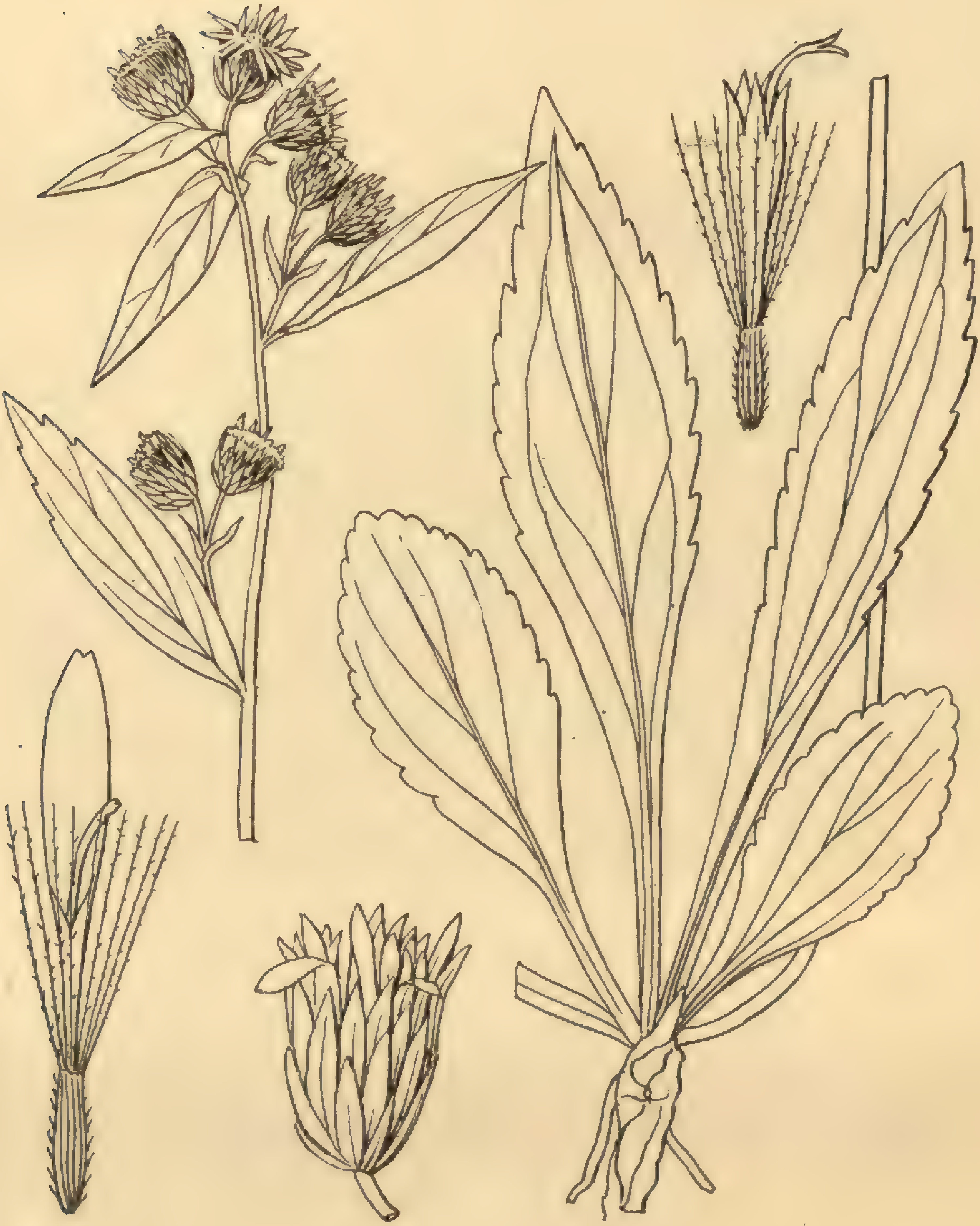

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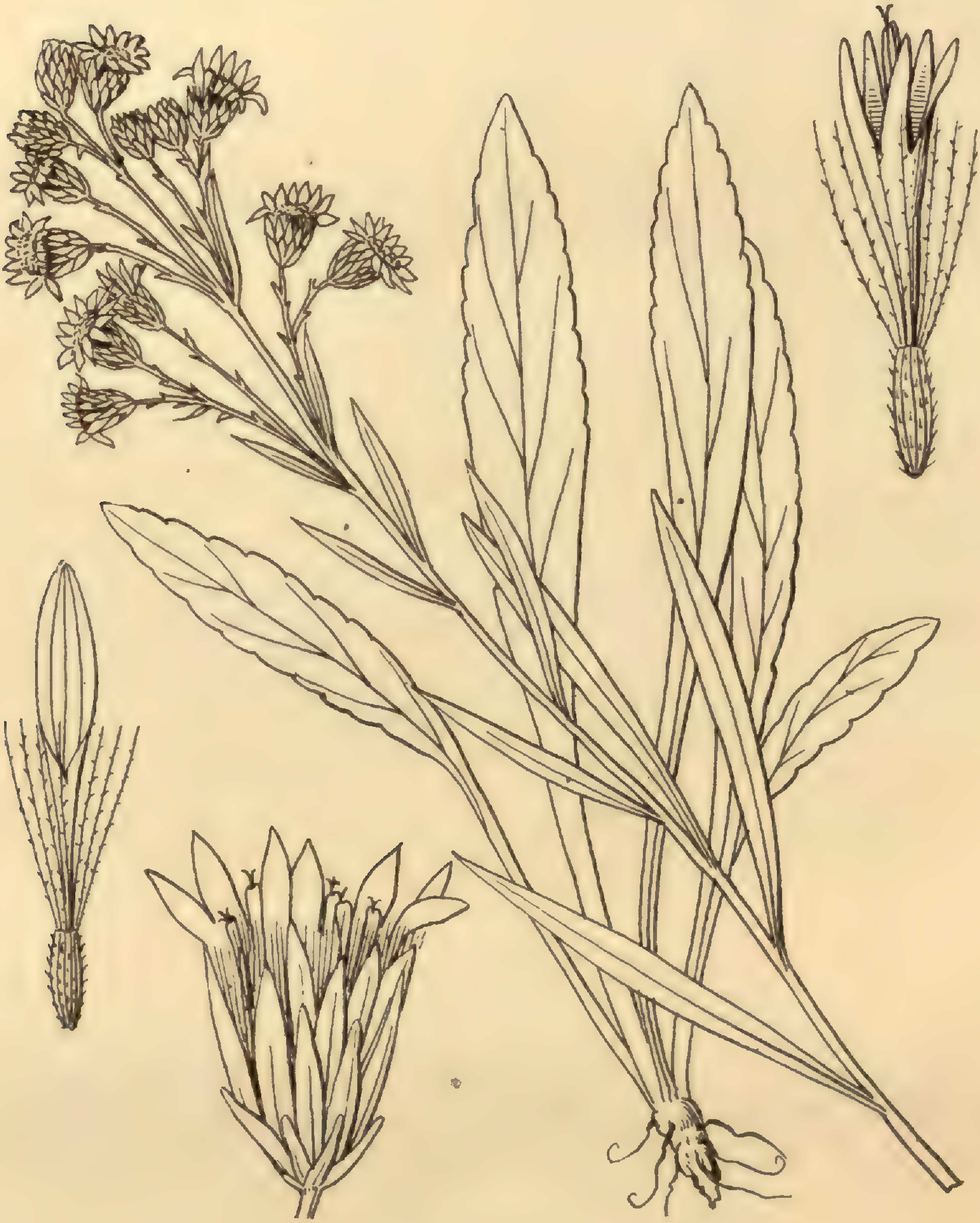

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VOL. XX. JUNE, 1893. No. 6.

BULLETIN

OF THE

TORREY BOTANICAL CLUB.

A MONTHLY JOURNAL OF BOTANY.

EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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BULLETIN
OF THE
TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., June 17, 1893. No. 6.

Notes on the Flora of Block Island.

BY W. W. BAILEY.

It had always been my ambition to botanize an island. I have envied Crusoe his leisure and opportunity. The possibility of compassing such a task commends it to the ambitious; one does not, as on a continent, feel appalled by the vast extent of the field. It seems a mere matter of faithful unremitting labor.

The island is of peculiar construction, indeed a vast terminal moraine. There is no rock *in situ*, but only a multitudinous mass of bowlders, pebbles, sand and clay. The bowlders are of various formation, many of them erratic from a long distance. Black magnetic sand is common on the beach. Some of the springs are strongly impregnated with iron. The island, viewed from Beacon Hill, looks like a petrified sea. It presents a most surprising undulating surface, and almost every valley or depression holds a pond or bog.

The cliffs of the south shore are very wonderful. Here we obtain a natural section and can view the strata, for rain, frost, and the action of the sea have denuded the land. I was often reminded of scenes in Nevada.

The mass of the bluff is of pure clay of a pale slate color. Over this is a loose deposit of bowlders and pebbles; over these again the loam. The cliffs, if one may so call them, have weathered into most fanciful shapes; minarets, towers, pinnacles, are piled up at random. Often a huge bowlder has lost its bedding and been hurled into the abyss. Again, one will be noticed poised too perilously near the brink; it is a mere question of time when it falls. On the most prominent bluff of all stands the southeast lighthouse. The keepers assured us that the sea was surely encroaching on the land.

I have never seen so changeable a shore. On one day the beach would be firm, hard sand; the next a mass of rattling pebbles. One could scarcely believe it was the same place.

The bogs and pond holes had a perennial fascination for me. There are said to be some three hundred on the island, and I can well believe it. They are filled with pond lilies, and surely there is no place in the world where they are finer. Occasionally a pink one turns up.

About these pond-holes grow, in the peat, a great variety of interesting plants. Two species ot sundew were found, the *Drosera rotundifolia*, and *D. intermedia* var. *Americana*. *Rhexia Virginica* was common. I never before saw so much of the ragged orchis (*Habenaria lacera*). Everywhere the swamp loose-strife, *Decodon*, was abundant. Here, too, could be seen quantities of *Iris versicolor*, three *Eriophorums*, cat-tails, sedges and grasses.

The prevailing shrub in the swamps was *Cephalanthus occidentalis*. In smaller quantities grew *Rosa Carolina*, and *Clethra alnifolia*. We found one bush only of what appeared to be *Ilex lævigata*. Willows were by no means common, and no species of *Alnus* was seen at all. Think of growing up without a knowledge of alder-tags! Trees of any sort are extremely scarce. Those there are, appear, with rare exceptions, to have been planted. Mr. J. F. Collins and myself, however, found a few small tupeloes, *Nyssa aquatica*. White poplars are the trees most cultivated. I saw besides a few *Ailanthus* trees and locusts. Protected apple-orchards do well. I found also one lone and stunted hickory. There is no sign anywhere of a conifer. Here and there one meets with good clumps of bayberry (*Myrica cerifera*), but *Comptonia* was not seen at all.

On the whole the flora, considering the situation, seemed to me very rich. We identified 294 species of plants and have some dozen or more things yet to determine. Then, too, the early season no doubt would reveal many things, while we lost nearly all the *Asters;* I think there are probably six or eight of these.

The region might well be mapped out into districts, as, of the bogs, the many fresh ponds, the Great Salt Pond, the meadows, the cliffs, and the shore. One might, indeed, include another province, in the range of the Algæ, these, however, from the changeable nature of the shore, are not so abundant as in many places along our coasts. Still we found glorious specimens of *Ascophyllum*, *Fucus*, and *Laminaria*.

Near the beach, of course, one finds *Anagallis arvensis*, a cosmopolitan plant. Here, too, are *Cakile edentula ;* the curious sea-sand-wort, *Arenaria peploides ;* sow thistle, *Sonchus asper ; Suæda*, *Salsola*, and *Solidago sempervirens.* The last grows magnificently, but was hardly in flower even when I left. I found in all seven species of golden-rod on the island, as will be seen by the appended list. *Solidago lanceolata* is, I think, the commonest weed on the island. It covers whole pastures and fringes every road. In some places the *S. Caroliniana* was about as common. We noticed quite a difference in the time of flowering of the two species, the last preceding the *S. lanceolata* by perhaps a week.

There is the usual host of weeds, among which the wild carrot is preëminently first. *Chrysanthemum Leucanthemum*, is a good second. Now and then one meets with a clump of *Rudbecki*d *hirta.* It is misnamed "ox-eye" throughout Rhode Island. There were four species of thistle, the "Canada" being well to the front.

My habit was to jot down in a note book, as I walked, whatever plants I saw, the walk being mainly for the special purpose of discovery. I also collected somewhat. For one week, long to be remembered by us both, I had the assistance of my young friend, Mr. J. F. Collins, of Providence.

Incidentally we observed the butterflies, finding, to our surprise, a large number of specimens of *Janonia cœnia.* Hitherto it has been only sporadically found in the State. The abundance of *Papilio Asterias* is explained from the prevalence of Umbelliferæ. The carrot and *Sium cicutæfolium* are everywhere. Nothing umbelliferous probably ever escapes the larva of *Asterias*, though I never happened to see it on *Discopleura*, so frequent here. *Danais Archippus* had found out that *Asclepias Syriaca* was here and hung his green and gold chrysalis on the leaves.

Among the plants new to Rhode Island, we found *Potamogeton* *pulcher*, and *Gaylussacia dumosa*, var. *hirtella*, There are seven ferns on our list, among them *Woodwardia areolata*. Although we found only its barren frond, we feel quite sure that no *Onoclea* deceived us. The two can be discriminated when placed side by side; we saw no *Pteris aquilina*. There were several *Equisetums*, and a number of mosses and lichens. Not a single plant of the lily family presented itself. This seems peculiar. One might at least expect some *Smilacina*. Among the orchids, besides the "ragged" already mentioned, we had *Gyrostachys præcox*, *G. simplex* and *G. gracilis*.

I have spoken of the total absence of Liliaceæ. It is curious to notice this non-appearance of the commonest plants of the main land. Thus, there were no *Lespedezas*, *Meibomias*, nor *Baptisias*. Not a specimen of *Hibiscus Moscheutos* was seen, nor any of the gentians, nor *Sabbatias*; Gentianaceæ are represented by *Limnanthemum* and *Menyanthes*. *Elatine Americana* was abundant in and around Sands, Pond. *Sagina procumbens* formed verdant clumps about the little springs on the cliffs. *Linum striatum* was abundant in the swamps. I saw no true *Geranium*, but the family Geraniaceæ was represented by *Oxalis corniculata* var. *stricta*, and by *Impatiens biflora*. *Ampelopsis quinquefolia* was so uncommon as to be called rare. *Rhus radicans*, while not so common as on the mainland, was far too abundant. *Rhus venenata* was not seen at all, though many localities seemed favorable for it. *Polygala polygama*, and *P. viridescens* were common. There were no Lupines nor *Cassias*, but *Lathyrus maritimus* throve on the southern cliffs, and we found also the genera *Phaseolus*, *Medicago* and *Trifolium*. Among the clovers was *Trifolium hybridum*, now seen everywhere in New England.

Rosaceæ were represented by *Spiræa tomentosa* and *S. salicifolia*, *Prunus maritima*, several species of *Rubus*, *Fragaria vesca*, the usual weedy *Potentillas*, and *Rosa Carolina*. The last formed quite abundant copses. We saw no Saxifragaceæ, which seems a little odd. I expected *Parnassia* at least. *Myriophyllum pinnatum*, was found in especially fine condition. Among Compositæ was the camphor-weed, *Pluchea camphorata*, growing with unusual vigor. To me it smells of anything but camphor. I was surprised to find *Cichorium Intybus* well established. As a rule, it is somewhat local in Rhode Island, and does not make itself at home as in Eastern Massachussetts. It is, with its large, deep-blue heads, a highly ornamental nuisance. I saw but one *Lobelia*, the common Indian tobacco, *L. inflata*. Among Primulaceæ I was glad to find a fine bed of *Samolus*. It grows in the sand near the Great Salt Pond.

The Labiatæ were represented by eleven genera and thirteen species—a good showing—among them was *Melissa officinalis*. *Polygonum* was another genus with full ranks. We recorded eight species. The surprising height of some plants was noticeable; thus some *Sparganiums* and *Sagittarias* were the giants of their race. I have a list of 28 grasses, and am sure that a number more might be found. Both Mr. Collins and myself rigorously excluded everything from our catalogue of which we had any lingering doubt.

I found myself speculating much, and perhaps wildly, as to the origin and remote history of these insular plants. How came they here? Are they in some cases descendants of old continental forms existing while yet Block Island was part of the mainland? On the other hand, did birds, winds, tide-currents, or the operations of man introduce them? Of course we can account for the presence of grasses and weeds. But how about the endemic species? The flora seems to me pretty full for the situation. Those who consult the following list will be struck by its length and by the curious lacunæ.

A List of Plants found on Block Island, R. I., in July and August.

By W. W. Bailey and J. F. Collins.

(From July 19th to end of August, 1892.)

RANUNCULACEÆ.

1. *Ranunculus Cymbalaria*, Pursh. Abundant about the Great Salt Pond, Aug.
2. *Ranunculus repens*, L.
3. *Ranunculus acris*, L.

NYMPHÆACEÆ.

4. *Castalia odorata* (Dryand.) Woodv. and Wood. Extremely abundant in nearly all the numerous fresh water ponds. Flowers in some instances measuring from 7 to 9 inches in diameter. Occasionally pink.
5. *Nymphæa advena* (Soland.), Greene. Quite common.

CRUCIFERÆ.

6. *Alyssum maritimum*, L. About yards. Barely Escaped.
7. *Nasturtium officinale*, R. Br. Abundant about springs. East side.
8. *Sisymbrium officinale* (L.) Scop.
9. *Brassica Sinapistrum*, Boiss.
10. *Brassica alba* (L.) Boiss.
11. *Brassica nigra* (L.) Koch.
12. *Brassica campestris*, L.
13. *Bursa pastoris* (L.) Weber.
14. *Lepidium Virginicum*, L.
15. *Cakile edentula* (Bigel.) Hook. Very common on sea beaches.
16. *Raphanus Raphanistrum*, L.

CISTACEÆ.

17. *Helianthemum majus* (L.) B. S. P.

VIOLACEÆ.

18. *Viola obliqua*, Hill.
19. *Viola sagittata*, Ait.
20. *Viola primulæfolia*, L.
21. *Viola lanceolata*, L. The violets were, of course, all out of flower.

CARYOPHYLLACEÆ.

22. *Dianthus Armeria*, L.
23. *Saponaria officinalis*, L.
24. *Arenaria serpyllifolia*, L.
25. *Arenaria peploides*, L. In occasional large patches on the beaches.
26. *Alsine media*, L.
27. *Cerastium vulgatum*, L.
28. *Sagina procumbens*, L. Springs on south cliffs.
29. *Tissa rubra* (L.) Britton.
30. *Tissa marina* (L.) Britton.
31. *Spergula arvensis*, L.

PORTULACACEÆ.

32. *Portulaca oleracea*, L.

ELATINACEÆ.

33. *Elatine Americana* (Pursh.) Arn. Borders of Sands Pond. Common.

HYPERICACEÆ.

34. *Hypericum perforatum*, L.
35. *Hypericum maculatum*, Walt.
36. *Hypericum mutilum*, L.
37. *Hypericum gentianoides* (L.) B. S. P.
38. *Elodes Virginica* (L.) Nutt.

MALVACEÆ.

39. *Malva rotundifolia*, L.
40. *Abutilon Avicennæ*, Gærtn.

LINACEÆ.

41. *Linum striatum*, Walt. Very common in the bogs. July.
42. *Linum usitatissimum*, L.

GERANIEÆ.

43. *Oxalis coruiculata*, L., Var. *stricta* (L.) Sav.
44. *Impatiens biflora*, Walt.

ILICINEÆ.

45. *Ilex lævigata* (Pursh.) A. Gray.

VITACEÆ.

46. *Vitis Labrusca*, L.
47. *Ampelopsis quinquefolia* (L.) Michx. Quite rare.

ANACARDIACEÆ.

48. *Rhus copallina*, L.
49. *Rhus radicans*, L.

POLYGALACEÆ.

50. *Polygala viridescens*, L.
51. *Polygala polygama*, Walt.

LEGUMINOSÆ.

52. *Trifolium arvense*, L.
53. *Trifolium pratense*, L.
54. *Trifolium repens*, L.
55. *Trifolium hybridum*, L.
56. *Melilotus alba*, Lam.
57. *Medicago sativa*, L. Scarce.
58. *Robinia pseudacacia*, L. Occasional about houses.
59. *Lathyrus maritimus* (L.) Bigel. Common on the beaches and bluffs.
60. *Apios tuberosa*, Mœnch. Occasional.
61. *Phaseolus helvolus*, L. Occasional.

ROSACEÆ.

62. *Prunus maritima*, Wang. Common.
63. *Prunus Virginiana*, L. A few specimens only.
64. *Spiræa salicifolia*, L. Occasional.
65. *Spiræa tomentosa*, L. Occasional.
66. *Rubus occidentalis*, L.
67. *Rubus villosus*, Ait.
68. *Rubus Canadensis*, L.
69. *Rubus hispidus*, L.
70. *Fragaria vesca*, L. Common.
71. *Potentilla Norvegica*, L.
72. *Potentilla argentea*, L.
73. *Potentilla Canadensis*, L.
74. *Rosa Carolina*, L.
75. *Rosa lucida*, Ehrh.
76. *Pyrus arbutifolia* (L.) L. f. Rare.

DROSERACEÆ.

77. *Drosera rotundifolia*, L. Very common.
78. *Drosera intermedia*, Hayne, Var. *Americana*, D. C. Very common.

HALORAGEÆ.

79. *Myriophyllum pinnatum* (Walt.) B. S. P. Common.
80. *Proserpinaca palustris*, L. Common.
81. *Callitriche verna*, L.

MELASTOMACEÆ.

82. *Rhexia Virginica*, L. Very common.

LYTHRACEÆ.

83. *Decodon verticillatus* (L.) Ell. Very abundant.

ONAGRACEAE.

84. *Ludwigia palustris* (L.) Ell. Common.
85. *Epilobium lineare*, Muhl.
86. *Epilobium coloratum*, Muhl.
87. *Epilobium adenocaulon*, Haussk. The most common species.
88. *Œnothera biennis*, L.

FICOIDEÆ.

89. *Mollugo verticillata*, L.

UMBELLIFERÆ.

90. *Daucus Carota*, L. The most common weed.
91. *Heracleum lanatum*, Michx. Southern cliffs.
92. *Sium cicutaefolium*, Gmelin. Very abundant.
93. *Cicuta maculata*, L. Occasional.
94. *Discopleura capillacea*, D. C. Very abundant.

CORNACEÆ.

95. *Nyssa aquatica*, L. A very few scattered trees in a sheltered valley.

CAPRIFOLIACEÆ.

96. *Sambucus Canadensis*, L. Rather frequent.
97. *Viburnum molle*, Michx. A few specimens only.

RUBIACEÆ.

98. *Cephalanthus occidentalis*, L. Filling most of the pond holes.
99. *Galium trifidum*, L. Common.

COMPOSITÆ.

100. *Eupatorium teucriifolium*, Willd.
101. *Eupatorium perfoliatum*, L.
102. *Solidago sempervirens*, L.
103. *Solidago rugosa*, Mill.
104. *Solidago juncea*, Ait.
105. *Solidago Canadensis*, L.
106. *Solidago nemoralis*, Ait.
107. *Solidago lanceolata*, L. Excessively common.

108. *Solidago Caroliniana* (L.) B. S. P. Nearly as much so.
109. *Aster lævis*, L.
110. *Aster vimineus*, Lam.
111. *Erigeron Canadensis*, L.
112. *Erigeron ramosus* (Walt.) B. S. P.
113. *Pluchea camphorata* (L.) D. C. Abundant and thrifty about Great Salt Pond. August.
114. *Antennaria plantaginifolia* (L.) Hook.
115. *Anaphalis margaritacea* (L.) Benth. and Hook.
116. *Gnaphalium obtusifolium*, L.
117. *Gnaphalium uliginosum*, L.
118. *Ambrosia artemisiæfolia*, L.
119. *Xanthium Canadense*, Mill.
120. *Rudbeckia hirta*, L.
121. *Helianthus tuberosus*, L. Sparingly escaped.
122. *Bidens frondosa*, L.
123. *Bidens cernua*, L.
124. *Bidens lævis* (L.) B. S. P. } probable, but not surely identified.
125. *Anthemis Cotula* (L.) D. C.
126. *Achillea Millefolium*, L. (Pink variety common.)
127. *Chrysanthemum Leucanthemum*, L. Abundant.
128. *Tanacetum vulgare*, L.
129. *Erechthites hieracifolia* (L.) Raf. About Salt Pond.
130. *Arctium Lappa*, L.
131. *Cnicus lanceolatus* (L.) Hoff.
132. *Cnicus horridulus*, Pursh.
133. *Cnicus altissimus* (L.) Willd., var. *discolor* (Spreng.) Gray.
134. *Cnicus arvensis* (L.) Hoff.
135. *Cichorium Intybus*, L. Quite common.
136. *Hieracium Gronovii*, L.
137. *Taraxacum officinale*, Weber.
138. *Lactuca Canadensis*, L.
139. *Lactuca spicata* (Lam.) Hitchc.
140. *Sonchus oleraceus*, L.
141. *Sonchus asper* (L.) Willd. Common on South cliffs.

LOBELIACEÆ.

142. *Lobelia inflata*, L.

ERICACEÆ.

143. *Gaylussacia dumosa* (L.) Torr. & Gray, var. *hirtella* (Ait.) A. Gray.
144. *Vaccinium macrocarpon*, Ait.
145. *Andromeda ligustrina* (L.) Muhl. Occasional.
146. *Kalmia angustifolia*, L. Occasional.
147. *Rhododendron viscosum* (L.) Torr. Occasional.
148. *Clethra alnifolia*, L. Rather common.

PRIMULACEÆ.

149. *Lysimachia terrestris* (L.) B. S. P. Common.
150. *Anagallis arvensis*, L. Common.
151. *Samolus floribundus*, H. B. K. Near the Salt Pond.

ASCLEPIADACEÆ.

152. *Asclepias Syriaca*, L. Common.

GENTIANACEÆ.

153. *Bartonia Virginica* (L.) B. S. P.
154. *Menyanthes trifoliata*, L.
155. *Limnanthenum lacunosum* (Vent.) Gris.

CONVOLVULACEÆ.

156. *Convolvulus sepium*, L.

SOLANACEÆ.

157. *Solanum nigrum*, L. Common and thrifty.
158. *Nicandra physaloides*, Gaertn. Found in one place only.
159. *Datura Tatula*, L.

SCROPHULARIACEÆ.

160. *Verbascum Thapsus*, L.
161. *Linaria Canadensis* (L.) Dumont.
162. *Linaria vulgaris*, Mill.
163. *Ilysanthes gratioloides* (L.) Benth.
164. *Gerardia purpurea*, L.
165. *Utricularia vulgaris*, L.

VERBENACEÆ.

166. *Verbena urticæfolia*, L. Occasional.
167. *Verbena hastata*, L. Very common.

LABIATÆ.

168. *Trichostema dichotomum*, L.
169. *Teucrium Canadense*, L.
170. *Mentha piperita*, L.
171. *Mentha arvensis*, L.
172. *Lycopus Virginicus*, L.
173. *Lycopus sinuatus*, Ell.
174. *Pycnanthemum linifolium*, Pursh. Scarce.
175. *Melissa officinalis*, L. Escaped.
176. *Hedeoma pulegioides* (L.) Pers.
177. *Nepeta Cataria*, L.
178. *Scutellaria lateriflora*, L.
179. *Scutellaria galericulata*, L.
180. *Brunella vulgaris*, L.
181. *Leonurus Cardiaca*, L.

PLANTAGINACEÆ.

182. *Plantago major*, L.
183. *Plantago Rugelii*, Decaisne.
184. *Plantago lanceolata*, L.
185. *Plantago Patagonica*, Juss., var. *aristata* (Nutt.) Grey.

AMARANTACEÆ

186. *Amarantus retroflexus*, L.
187. *Amarantus albus*, L.

CHENOPODIACEÆ.

189. *Chenopodium album*, L.
190. *Atriplex patula*, L.
191. *Salicornia herbacea*, L.
192. *Suæda linearis* (Ell.) Moq.
193. *Salsola Kali*, L.

PHYTOLACCACEÆ.

194. *Phytolacca decandra*, L.

POLYGONACEÆ.

195. *Rumex crispus*, L.
196. *Rumex Actosella*, L.
197. *Polygonum aviculare*, L.
198. *Polygonum erectum*, L.
199. *Polygonum Pennsylvanicum*, L.
200. *Polygonum Persicaria*, L.
201. *Polygonum hydropiperoides*, Michx.
202. *Polygonum Hydropiper*, L.
203. *Polygonnm sagittatum*, L.
204. *Polygonum dumetorum*, L., var. *scandens* (L.) Gray.

EUPHORBIACEÆ.

205. *Euphorbia polygonifolia*, L.
206. *Euphorbia maculata*, L.
207. *Acalypha Virginica*, L.

URTICACEÆ.

208. *Humulus Lupulus*, L.
209. *Urtica dioica*, L.

MYRICACEÆ.

210. *Myrica cerifera*, L. Hardly common.

SALICACEÆ.

211. *Salix*. Several species apparently introduced.
212. *Populus alba*, L. About most houses.

ORCHIDACEÆ.

213. *Gyrostachys præcox* (Walt.) Kuntze. August.
214. *Gyrostachys gracilis* (Bigel.) Kuntze. August.
215. *Gyrostachys simplex* (Gray) Kuntze. August.
216. *Pogonia ophioglossoides* (L.) Ker. July—August.
217. *Habenaria tridentata* (Willd.) Hook. Very common. July.
218. *Habenaria lacera* (Michx.) R. Br. Very common. July.

IRIDACEÆ.

219. *Iris versicolor*, L. Common.
220. *Sisyrhynchium anceps*, Cav.

LILIACEÆ.

221. *Smilax glauca*, Walt.

PONTEDERIACEÆ.

222. *Pontederia cordata*, L. July, August. Very common.

XYRIDACEÆ.

223. *Xyris Caroliniana*, Walt. August. Very Common.

JUNCACEÆ.

224. *Juncus effusus*, L.
225. *Juncus marginatus*, Rostk.
226. *Juncus tenuis*, Willd.
227. *Juncus bufonius*, L.
228. *Juncus pelocarpus*, E. Meyer.
229. *Juncus Canadensis*, J. Gay., var. *longicaudatus*. Engelm.

TYPHACEÆ.

230. *Typha latifolia*, L.
231. *Typha angustifolia*, L.
232. *Sparganium eurycarpum*, Engelm.
233. *Sparganium simplex*, Hudson.

ARACEÆ.

234. *Acorus Calamus*, L.

LEMNACEÆ.

235. *Lemna minor*, L.

ALISMACEÆ.

236. *Sagittaria variabilis*, Engelm. Common and thrifty.

NAIADACEÆ.

237. *Potamogeton hybridus*, Michx.
238. *Potamogeton pulcher*, Tuckerm.

CYPERACEÆ.

239. *Cyperus Nuttallii*, Torr.
240. *Cyperus filiculmis*, Vahl.
241. *Cyperus dentatus*, Torr.
242. *Cyperus strigosus*, L.
243. *Dulichium spathaceum* (L.) Pers.
244. *Eleocharis ovata* (Willd.) R. Br.
245. *Scirpus Americanus*, Pers.
246. *Scirpus robustus*, Pursh.
247. *Eriophorum cyperinum*, L.
248. *Eriophorum Virginicum*, L.
249. *Eriophorum gracile*, Koch.
250. *Rynchospora alba* (L.) Vahl.
251. *Rynchospora glomerata* (L.) Vahl.
252. *Carex bullata*, Schk.
253. *Carex lurida*, Wahl.
254. *Carex Pseudo-cyperus*, L. var. *comosa* (Boott.) W. Boott.
255. *Carex straminea*, Willd.

GRAMINEÆ.

256. *Spartina cynosuroides* (L.) Willd.
257. *Spartina juncea* (Michx.) Willd.
258. *Spartina stricta*, Roth, var. *glabra* (Muhl.) Gray.
259. *Paspalum setaceum*, Michx.
260. *Panicum sanguinale*, L.
261. *Panicum proliferum*, Lam.
262. *Panicum capillare*, L.
263. *Panicum vigatum*, L.
264. *Panicum clandestinum*, L.
265. *Panicum dichotomum*, L.
267. *Panicum Crus-Galli*, L.
268. *Chamæraphis glauca* (L.) Kuretze.
269. *Cenchrus tribuloides*, L.
270. *Homalocenchrus oryzoides* (L.) Poll.
271. *Andropogon scoparius*, Michx.
272. *Aristida dichotoma*, L.
273. *Phleum pratense*, L.
274. *Agrostis alba*, L.
275. *Agrostis canina*, L.
276. *Ammophila arundinacea* (L.) Host.
577. *Holcus lanatus*, L.
278. *Danthonia spicata* (L.) Beauv.
279. *Phragmites vulgaris* (Lam.) B. S. P.
280. *Eragrostis pectinacea* (Michx.) Gray.
282. *Poa annua*, L.
283. *Panicularia Canadensis* (Michx.) Kuntze.
284. *Panicularia obtusa* (Nutt.) Kuntze.
285. *Agropyrum repens* (L.) Beauv.

EQUISETACEÆ.

286. *Equisetum arvense*, L.

FILICES.

287. *Woodwardia areolata* (L.) Moore.
288. *Asplenium Filix-fœmina* (L.) Bernh.
289. *Dryopteris Thelypteris* (L.) A. Gray.
290. *Dryoperis Noveboracense* (L.) A. Gray.
291. *Onoclea sensibilis*, L.
292. *Dicksonia punctilobula* (Michx.) A. Gray.
293. *Osmunda cinnamomea*, L.

LYCOPODIACEÆ.

294. *Lycopodium inundatum*, L.

Notes on the Rhode Island Flora.

By J. F. Collins.

Since the publication of the "Plants of R. I." in 1888, many additions have been reported to the author, Mr. Bennett, although it is safe to say there has been very little active work on our State flora since that date. Upon determining the specimens collected by me the past season I find more than 35 species among them not previously recorded as occurring in Rhode Island. Added to these an equal number detected in the two preceding years, and we have a list of 70 species (and varieties) collected by a person who has but a few hours each week to devote to botanical work. Does this not point to "Little Rhody" as still being an interesting field for the local collector?

The greater part of the specimens were collected within the city limits, but little time being found in which to take trips of any length outside. Consequently, as might be expected, the wastes have yielded a large portion, many of which have not fully demonstrated their ability to persist, while of others only single plants have been found. It is my object in these brief notes to mention only some of the more interesting additions and only those collected by me either alone or in company with others. All are represented by specimens in my herbarium, and where duplicates were obtained they have usually been placed in Brown University Herbarium also. Unless otherwise noted all species were collected in this city in 1892.

Nasturtium lacustre, A. Gray, 1890.

Lepidium intermedium, A. Gray, with *L. Virginicum* and *L. ruderale.*

Gypsophila muralis, L., at one station in the southwestern portion of the city, where it has been slowly spreading for the past three seasons, but is still confined to a very limited area in a sandy field.

Lychnis diurna, Sibth., a peculiar form which Dr. Robinson informs me is known to European seedmen as *Melandrium diurnum*, var. *crassifolium.* Wastes only.

Stellaria graminea, L., quite common in grassy places along roadsides, and similar situations. 1884, 1891, etc.

The station for *Lotus corniculatus* (Bot. Gaz. xvii., 229) from which only three specimens were obtained in June was obliterated soon afterwards.

Glycyrrhiza lepidota, Nutt., Cove Lands, J. L. Bennett, 1891; G. H. Leland and J. F. Collins, 1892.

Vicia hirsuta (L.) Koch., a dozen or more specimens obtained. Leland and Collins.

Astilbe Japonica, Miq., seemingly well established and spreading at one station, 1890,–'91,–'92.

Epilobium adenocaulon, Haussk., appears to have escaped detection until July 9th. Since that date I have found it at several stations about the city. At suburban Elmwood it seems to be a common species, particularly on the east shore of Mashapaug pond, where no other *Epilobium* was noticed. In some woods near the pond it grows with *E. coloratum*, Muhl. It has undoubtedly been heretofore confounded with the latter species.

Scandix Pecten-veneris, L., 1890, J. F. C.; 1892, Leland and Collins.

Symphoricarpos racemosus, Michx.; at one station for several years. Possibly an escape.

Galium tricorne, With., several specimens; W. W. Bailey, Leland, Collins.

Grindelia squarrosa, Dunal, and *Artemisia Ludoviciana*, Nutt. Growing together, abundant and apparently well established on wastes.

The latter first noticed at another station while collecting with Prof. Bailey.

Carduus nutans, L. Since 1890, G. Bailey, Bennett, Leland, Collins.

Mentha Canadensis, L., var. *glabrata*, Benth. Shore of Mashapaug Pond.

Dracocephalum parviflorum, Nutt. A single thrifty plant which has fruited abundantly in a place where it is not likely to be destroyed. W. W. Bailey, Collins.

Stachys annua, L. Wastes at one station.

Stachys Germanica, L. Wastes, 1890, G. Bailey, Collins.

This has not to my knowledge been detected since.

Amarantus blitoides, Wats., several times on wastes.

Juncus Canadensis, J. Gay, var. *coarctatus*, Engelm. Wet shores, etc. Elmwood, 1890–91–92; Benedict pond, 1892. Quite abundant at both these stations.

Sagittaria natans, Mx. var. (?) *gracillima*, Wats. In the summer of 1889, while canoeing and collecting on the Ten Mile river above the old Hunt's Grain Mills, in E. Providence, R. I., I noticed large patches of a plant whose long, narrow, delicate leaves floated from 1–3 feet of their length on the surface of the water. Paddling a little farther I soon detected the flowers and obtained a few good specimens. In examining the plants later in the day I was unable to determine the species from any book at hand, and they were temporarily pigeon-holed. Before an opportunity occurred to again look them over, the 6th edition of Gray's Manual appeared, in which the above-named variety was described. This proved to fit my specimens, and the following season I obtained more and better ones, but without fruit, although the plants were abundant.

The river at the place mentioned has been generally considered as the boundary between Massachusetts and Rhode Island, but according to the latest topographical map (surveyed in 1888) the river flows wholly within the borders of the latter State after once entering at Lebanon, yet nowhere north of Hunt's Mills is it more than a quarter of a mile from Massachusetts. Specimens are in the Brown University and Gray Herbaria.

Potamogeton pulcher, Tuck. Found to be one of the commonest pond weeds in many of the pond holes on Block Island. W. W. Bailey and Collins. When collected it was supposed to be the first record for Rhode Island. It was, however, reported from Wakefield in 1890 (to Mr. Bennett).

Naias gracillima (A. Br.) Morong. Benedict pond, also elsewhere by other collectors.

Carex virescens, Muhl. var. *costata*, Dewey, 1890.

C. laxiflora, Lam., var. *varians*, Bailey. Cumberland, 1886; Providence, 1892.

C. laxiflora, Lam., var. *latifolia*, Boott., 1891.

C. echinata, Murray, var. *angustata*, Bailey.

Eragrostis Purshii, Schrader. Abundant along the railway and in woods at Elmwood, R. I., 1884–90–92.

Festuca elatior, L., and also the variety *pratensis*, Gray. Grassy places, 1889–91–92.

PROVIDENCE, R. I.

A Preliminary List of the Plants found in the Ridgewood Water Supply of the City of Brooklyn, King's County, N. Y.

BY SMITH ELY JELLIFFE.

Since the 1st of November, 1892, weekly examinations have been made of the plant life in the drinking water of Brooklyn. The water was taken from the tap of the third-story of a house near Prospect Park. One day in each week it was allowed to run for 24 hours through a filter. The residue was then collected and examined during the week and then kept in glass vials for future comparative study. The following list is a preliminary one, the research being intended to cover the space of one year.

SCHIZOMYCETES.

The examination for bacteria was only partial and purely experimental, Esmarchsproll's were made once each month, but the isolation of the various colonies was not completely carried out.

Bacillus fluorescens, liquefaciens. This bacterium has been prevalent in every month's supply thus far examined.

Bacillus fluorescens, non liquefaciens. Less frequent than the first, still constant.

Bacillus violaceus. Once only observed.

Bacillus subtilis, Cohn. Present throughout the time of the examinations.

CYANOPHYCEÆ.

Oscillaria limosa, Ag. Found throughout February.

Oscillaria Frœlichii, Kütz. Infrequent.

O. aeruigeneo-cærulea, Kütz. December 17, 1892.

CHLOROPHYCEÆ.

Scenedesmus caudatus, Corda. Frequent throughout the six months.

S. dimorphus, Kütz. January 18th.

Pediastrum Boryanum (Turp.) Mengh. November, March.

P. Ehrenberghii (Corda) A. Br. November, March.

P. pertusum, Kütz. December.

Raphidium polymorphum, Fres. Frequent throughout the six months.

var. *sigmoidea*, Rab. January 1st and 18, 1893.

var. *aciculare*, A. Br. January 1, 1893.

Polyedrium longispinum (Pertz.) Rab. Occasional.

Characium Nægelii, A. Br. Observed once only, diagnosis uncertain.

Pleurococcus vulgaris, Menegh. Infrequent.

Dictyosphærium Ehrenberghii, Näg. Occasional.

Spirogyra tenuissima (Hass.) Kütz. During the latter part of January and during February the water was very low in the reservoirs and this species appeared in great quantities.

S. varians (Hass.) Kütz. With the former but in much smaller quantities.

Coleochæte soluta, Prings. December 17th–24th. What seemed to be a broken fragment of this plant.

DESMIDEÆ.

Hyalotheca dissiliens (Smith) Breb. Common from January 29, on.

Desmidium aptogonium, Breb. With *Hyalotheca dissiliens.*

D. Baileyi (Ralfs) Wolle. Only once observed. April 15.

Sphærozosma filiforme, Rab. Occasional.

S. excavatum, Ralfs. Occasional.

S. spinulosum, Deep. ? A plant that resembled this was observed Dec. 2.

Closterium gracile, Breb. Infrequent.

C. striolatum, Ehrb. Occasional.

C. Dianæ, Ehrb. Frequent.

C. rostratum, Ehrb. Common.

Docidium Trabecula (Ehrb.) Näg. Common lately.

Cosmarium moniliforme, Ralfs. Infrequent.

C. Beckii, Wille. Scarce.

Xanthidium cristatum (Breb.) Ralfs. November 27, 1892.

X. antelopæum (Breb.) Kütz. Occasional.

Arthrodesmus Incus (Ehrb.) Hass. Occasional.

A. octocornis, Ehrb. Infrequent.

Micrasterias Torreyi (Bailey) Ralfs. November 23, 1892.
M. radiosa (Ag.) Ralfs. Occasional.
M. denticulata (Breb.) Ralfs. April, 1893.
M. fimbriata, Ralfs. Occasional.
M. Americana (Ehrb.) Kütz. Occasional.
Staurastrum dejectum, Breb. November and April.
S. brevispinum, Breb. Frequent.
S. aristiferum, Ralfs. Infrequent.
S. brachiatum, Ralfs. Infrequent.
S. cuspidatum, Breb. December, 2–24.
S. polymorphum, Breb. Infrequent.
S. crenulatum, Naeg. Common.
S. punctulatum, Breb. December 2.
S. hirsutum (Ehrb.) Breb. April.
S. Arctiscon, Ehrb. Frequent.

DIATOMACEÆ.

Amphora ovalis, Kütz. December 17.
Encyonema ventricosa, Kütz. Not rare.
Stauroneis anceps, Ehrb. Infrequent.
Navicula cuspidata, Kütz. Not common.
N. dilatata, Ehrb. December 17.
N. gibba (Kütz.) Ehrb. Frequent.
N. radiosa, Kütz. Frequent.
N. rhyncocephala, Kg. ?
N. viridis, Kütz. Small forms, infrequent.
Pleurosigma Spenceri, W. Sm. Occasional.
Pleurosigma, sp. indet.
Amphiprora ornata, Bailey. Frequent.
Gomphonema acuminatum, Ehrb. Frequent, var. *coronata*, Ehrb. December 17.
G. capitatum, Ehrb. February 11.
Cocconeis Pediculus, Ehrb. April.
Epithemia gibba (Ehrb.) Kütz. December 2.
Eunotia tridentula, Ehrb. ?
Synedra pulchella, Kütz. Frequent.
S. Ulna (Nitzsch.) Ehrb. Common.
Synedra, sp. indet. Common.

Fragilaria capucina, Desmaz. Common.
Asterionella formosa, Hass. Very common.
Meridion circulare, Ag. Infrequent.
Tabellaria fenestrata, Kütz. Very common.
T. floculosa (Roth.) Kütz. Very common.
Surirella elegans, Ehrb. This large species appeared when the water was very low with *Spirogyra tenuissima*.
Nitzschia, sp. indet.
Melosira granulata (Ehrb.) Ralfs. Very common.
M. varians, Ag. Infrequent.
Rhizosolenia gracilis, H. L. S. Not infrequent.
Tessela interrupta, Ehrb. Placed here provisionally.
Stephanodiscus minutus, Grun. Frequent.
Volvox globator, L. One specimen noted in November.
Gonium pectorale, L. Infrequent.

196 6TH AVE. BROOKLYN, N. Y.

Identity of Anthracnose of the Bean and Watermelon.

BY BYRON D. HALSTED.

The Fungus causing the spotting of bean pods shown in figure 1, was first observed by Lindemuth at Popplesdorf in 1875. It was named *Glœosporium Lindemuthianum* in his honor by Saccardo and Magnus and described in Michelia, i. 129. In 1878 in his

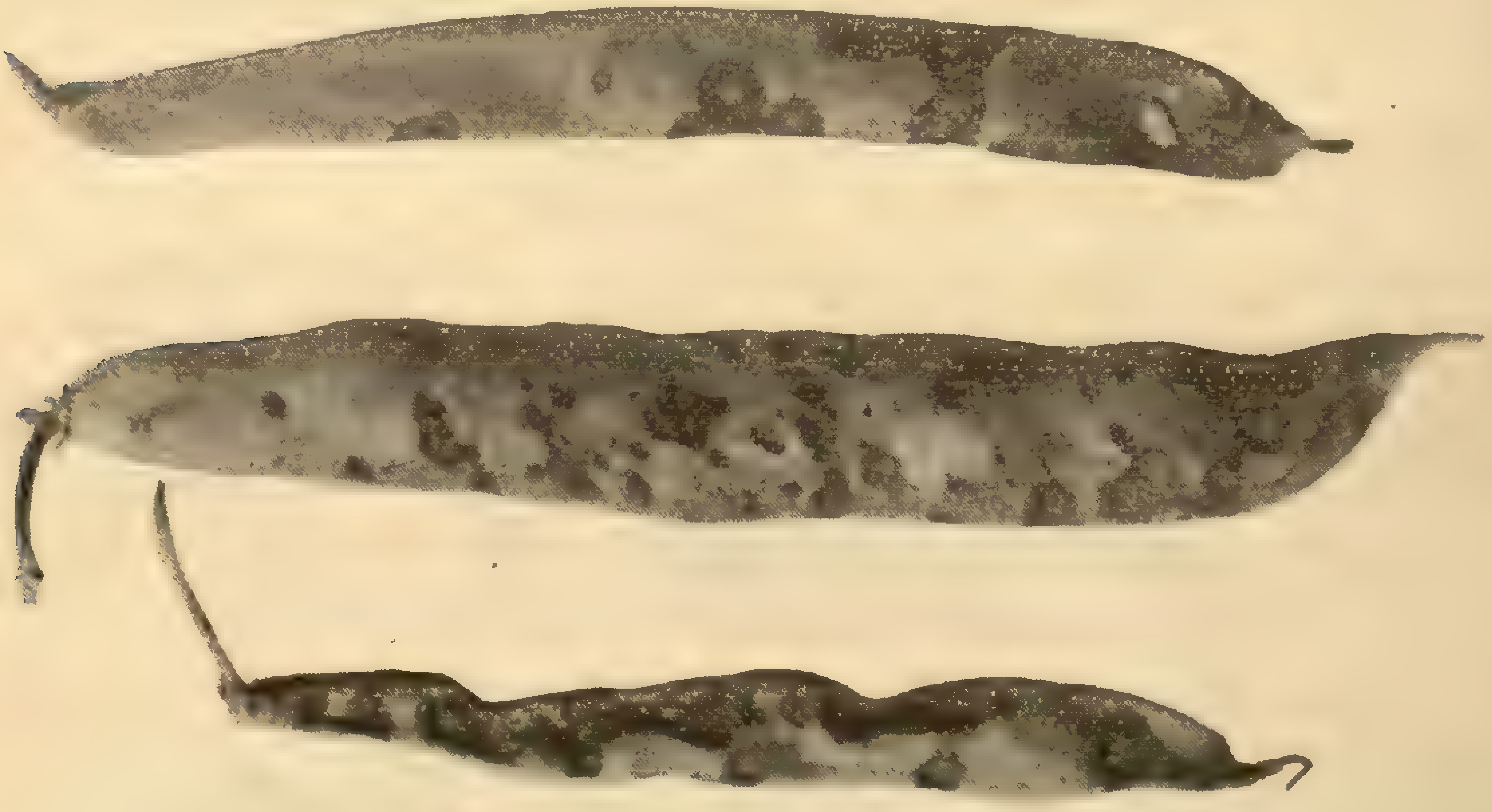

FIG. 1.—BEANS WITH POD-SPOT.

Report of the Section of Vegatable Pathology for 1887 Professor Scribner records the presence of setæ in the acervuli and suggests that the species might be placed in the genus Colletotrichum. Briosi and Cavara in 1889 made the transfer of the species to that genus and the name became *Colletotrichum Lindemuthianum* (S. & M.), Brio. & Cav., and as such is published as No. 50 in "Briosi and Cavara Funghi Parassiti Della Piante Cultivati." Of special interest in this connection is the statement made by Professor Scribner in the Report previously cited that, "In this country the disease attacks watermelon rinds as well as beans." Farlow records it as upon the watermelon.*

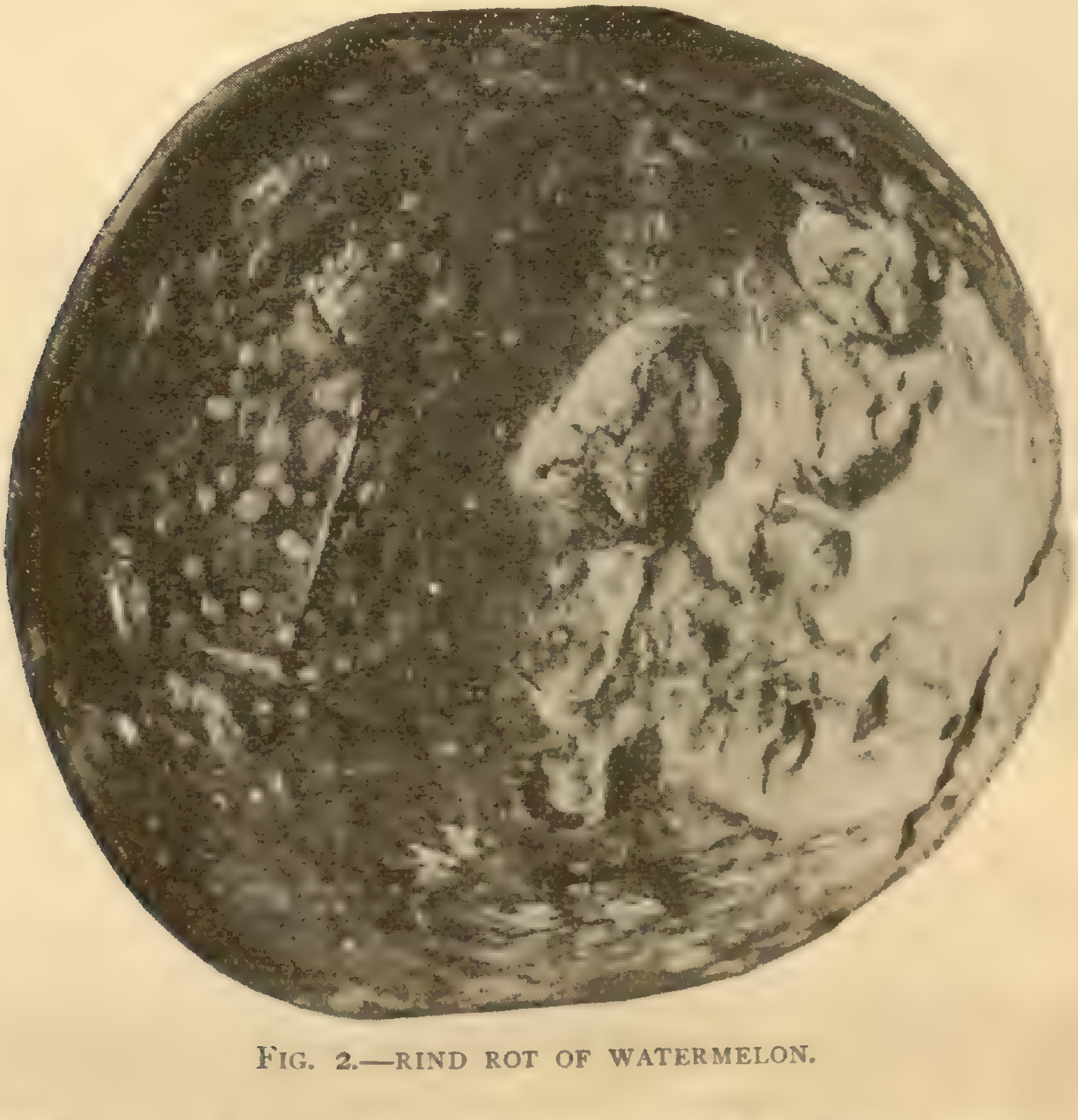

FIG. 2.—RIND ROT OF WATERMELON.

Turning now to the Anthracnose of the watermelon shown in figure 2, it is found that three species of Glœosporium are recorded for Cucurbitaceous fruits, the *G. Lagenarium* (Pass.), Sacc. & Roum. only requiring attention.

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* Host. Ind. part 1, p. 47.

In Farlow's Host Index this species is recorded for the following Cucurbits: *Citrellus vulgaris* (Watermelon), *Cucumis Melo* (Muskmelon), *Cucumis sativus* (Cucumber), *Cucurbita Pepo* (Pumpkin), and *Cucurbita* sp. (Squashes).

Early last summer a serious blight of the muskmelon found at Port Monmouth, N. J., by the writer was traced to a *Colletotrichum* which agreed in all particulars with the one upon the bean. Blighted foliage of the watermelon gathered the season before upon examination showed the same characteristics of acervuli, spores and setæ. A blight of cucumbers bitterly complained of in 1890 through the central portion of the State was due to the same anthracnose.

The seemingly perfect agreement of the fungus of these three cucurbit hosts with the Colletotrichum of the bean suggested that the setæ of the so-called *Glœosporium Lagenarium* had been overlooked and inoculations were made for further evidence in the matter. It was not difficult to transfer the watermelon anthracnose to the bean. But the points that may be of interest were the results with a third fruit because admitting of parallel inoculations for both the bean and the watermelon.

Citrons small enough to go under a medium sized tall bell-jar were selected and at first inoculations were made from the watermelon here and there under the skin of the citron, the virus taking quite uniformly and growing luxuriantly.

The *Colletotrichum* virus was taken from the bean and applied to the citron at a few points upon the side of an ink line drawn lengthwise of the fruit, while similar inoculations were made from the watermelon on the other side. Both grew with about equal rapidity and when prolonged the results blended showing identical results as shown in figure 3. In short the appearance to the naked eye was the same and the microscope showed no differences. The work was repeated with uniform results.

Specimen No. 1173, *b*. Ellis, N. A. F., were destributed as "*Glœosporium Lindemuthianum*, S. & M., on watermelon rinds, Wisconsin, Sept., 1885, Prof. A. B. Seymour," At a later date a new label was issued changing the species to *Glœosporium Lagenarium* (Pass.). These specimens show an abundance of setæ in the acervuli and in all points agree with the virus as above used for inoculation.

Years later specimens No. 2448, Ellis N. A. F., were destributed as *Glœosporium Lagenarium* (Pass.), var. *foliicolum*, E. & E., *a* being upon *Cucumis sativus* leaves, and *b*, upon *Citrellus vulgaris* foliage. There is also added leaves of muskmelon with the same fungus.

These all are first-class samples of apparently one and the same *Colletotrichum*, with a *Phyllosticta* associated with it upon the muskmelon. A note accompanies the specimens as follows: "Briosi and Cavara in their Funghi Parassiti No. 100; place this in Colletotrichum (C. *oligochætum*, Cav.), but if, as we think, this is only a foliicolous form of G. *Lagenarium* it should be C. *Lagenarium* (Pass.)."

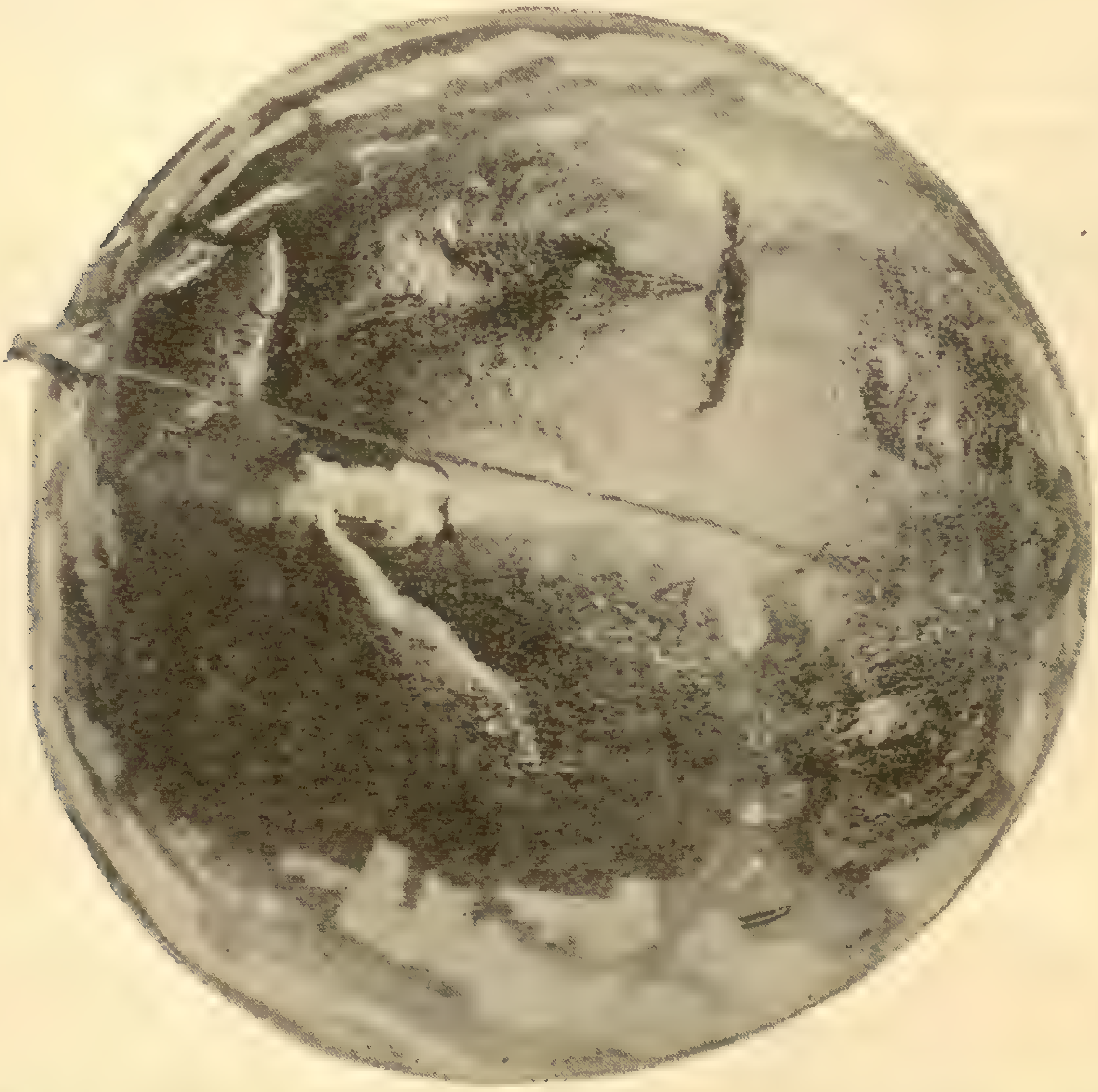

FIG. 3.—CITRON INOCULATED FROM BOTH BEAN AND WATERMELON.

An examination of Cavara's species does not show marked points of difference from the Colletotrichum treated above under *Glœosporium Lagenarium*. According to the author the smaller spores and basidia, but chiefly the presence of setæ, serve to separate this from *Glœosporinm Lagenarium*. In other words, he fails to realize that under further study the setæ have been found in the so-called *Glœosporium Lagenarium* as they were in *Glœosporium Lindemuthianum*, and both become *Colletotrichums* and what is more they are probably the same species.

It then remains to see what the name of the combined species shall be. The species under consideration was first published in 1868 by G. Passerini in Erbario Crittigamico Italiano as follows: "*Fusarium Lagenarium*, Pass. Minutum plerumque orbiculare sub epidermis nascens; sporae tereti-oblongatæ, rectæ vel curvulæ interdum oblongo-subclavatæ, nucleo grumoso foetæ pallescentes e basidiis brevissimis densissimeque nascentes epiderme rupta cirrhose diffluentes, demum in acervos irregulares aurantiacos effusæ. Auf Fruchten einer Lagenaria."

This is prior to the *Glœosporium Lindemuthianum*, of Saccardo and Magnus, and therefore the species for the anthracnose of the melon and the bean becomes *Colletotrichnm Lagenarium* (Pass.), as suggested by Ellis in 1890 in his xxv. century of N. A. F. No. 2448.

The following is the synonomy:

Fusarium Lagenarium, Passerini (1868).
Glœosporium Lagenarium (Pass.) Sacc. & Roum. (1880).
Colletotrichum Lindemuthianum (S. & M.) Briosi & Cavara (1889).
Colletotrichum Lagenarium (Pass.) E. & Hals., 1893.

Some New Weed Fungi.

By Byron D. Halsted.

The fungi below described are being distributed in Seymour and Earle's "Economic Fungi" Fascicles VI.–VIII.

Phyllostica pallida. Spots large, pale, indefinite; pycnidia usually epiphyllous, dark brown, punctiform, abundant, 45–170 μ in diameter; ostiolum distinct, dark-bordered; spores oblong, mostly straight 4–7 by 1.5–2 μ On leaves of *Silene noctiflora*. Syracuse, N. Y., August, 1892. F. L. Stevens.

Phyllosticta guttulatæ. Spots ash-colored, usually covering whole leaflet; pycnidia large, numerous, black; ostiolum prominent; spores oval, pointed, 9–10 by 3–4 μ., 2–guttulate. On stems and leaves of *Oxalis corniculata*, L., var. *stricta* (L.), Sav. New Brunswick, N. J., July, 1892. A. D. Selby.

Phoma Amaranthi. Spots large, indefinite; pycnidia dark brown, irregular, often confluent, prominent, much scattered; spores oval, hyaline, 13–16 μ by 10–12 On stems of *Amarantus chlorostachys.* New Brunswick, N. J., October, 1892. J. A. Kelsey.

Septoria Chrysanthemi. Spots well-defined, dark, equally conspicuous upon both sides of the leaf; pycnidia scattered, ellipsoid (70–160 μ.), pale brown; spores often bent with one end blunt, 14–30 by 1.5–2 μ, hyaline, 3–5-septate. On leaves of *Chrysanthemum Leucanthemum.* Milltown, N. J., June, 1892. F. L. Stevens.

Tubercularia Rhois. Spots large, brown, concentric, often confluent, becoming apparently worm-eaten; sporodochia disc-shaped, pinkish, scattered; spores hyaline, slightly curved, 6–8 by 2–3 μ. On leaves of *Rhus radicans*, L. New Brunswick, N. J., September, 1882. F. L. Stevens.

Coryneum Rhois. Spots ill-defined, brownish-yellow; acervuli large, scattered; spores fusoid, triseptate, slightly bent, sub-hyaline, 20–30 by 2.5–5 μ. On leaves of *Rhus radicans*, L. New Brunswick, N. J., September, 1892. F. L. Stevens.

Cercospora Molluginis. Spots indefinite, yellowish, turning to brown; hyphæ amphigenous, fasciculate from a brownish base, sub-flexuous, 50–60 by 4–5 μ. Conidia very long and slender, tapering, hyaline, slightly curved, multiseptate, 150–450 by 3–4 μ On leaves of *Mollugo verticillata*, L. Short Hills, N. J., September, 1892.

Cercospora Arcti-Ambrosiæ. Spots minute, brown, angular, usually with a white center; hyphæ amphigenous, fasciculate from a dark base, geniculate, cylindrical, 80–100 by 3–5 μ; conidia hyaline, curved, tapering, multiseptate, 50–125 by 2.5–3.5 μ On leaves of *Arctium Lappa* and *Ambrosia trifida.* New Brunswick, N. J., September, 1892. F. L. Stevens.

Colletotrichum Xanthi. Acervuli very large, the affected portion of the stem swollen, often bent, and the surface having a pink color. Setæ stout, bent, septate, not numerous; spores oblong, straight, 12–15 by 4–5 μ. On stems of *Xanthium Canadense.* Near Cape May, N. J., September, 1892.

COLLETOTRICHUM VERMICULARIOIDES. Spots variable, often confluent, border ash-colored with a dark center. Acervuli abundant with numerous black, rigid setæ. Spores oval, hyaline, 12–15 by 4–5 μ. The dark hyphæ at the base of the acervuli give the outward appearance of a *Vermicularia*, hence its name. On leaves and stems of *Linaria vulgaris*, Mill. New Brunswick, N. J., September, 1892.

ENTYLOMA ALSINES. Spots indefinite, pale; conidia fasciculate, filiform, 50–90 by 2 μ; spores globose, thin-walled, hyaline, smooth, 12–18 μ. On *Alsine media*. New Brunswick, N. J., July, 1892.

Additions to the New Jersey Flora.

Three species of plants, not heretofore recorded for the State of New Jersey, have been found in the vicinity of New Brunswick in considerable numbers during the two past years.

The first of these was seen by Mr. J. A. Kelsey in 1891, but no attempt at classification was made till the following year, when it was determined as *Sisymbrium Alliaria* (L.) Scop. Only two small bunches of it were seen, one under a cliff close to the bank of the Raritan River, and the other near by on top of the cliff. Later in the season it was discovered that the plant was liberally distributed over an area of several square miles of the adjoining country, and in some places was so abundant as to be considered a weed by the farmers, who, recognizing its affinity to the Cruciferæ, had already christened it White Mustard. The Manual gives the locality of this plant as "near Georgetown, D. C."

Triosteum angustifolium, L., credited by the Manual with growing anywhere from Virginia to Illinois and from Missouri to Alabama, was found by the writer in abundance in moist woods near Milltown, N. J., in June 1892, and in August the fruiting plants were collected at Rocky Hill, N. J., where they were abundant and very conspicuous on account of the bright color of the drupes.

Scutellaria parvula, Michx., was found in 1892 at Piscataway, N. J., in small quantity, and was very abundant on the cliffs on the banks of the Raritan just north of New Brunswick, where it has been noticed for several years.

F. L. STEVENS.

NEW BRUNSWICK, N. J., April 17, 1893.

[The discovery of *Triosteum angustifolium* in Central New Jersey is of much interest because it connects the outlying station long known at Glen Cove, Long Island (BULLETIN, i. 41, ii. 2), with those in Pennsylvania and Virginia; *Scutellaria parvula* and *Sisymbrium Alliaria* were both collected at New Brunswick by Miss Anna M. Vail in 1890, but the station does not seem to have been recorded; the latter has long been known from Long Island (BULLETIN, i. 22, xi. 83) and Westchester county, N. Y. (BULLETIN, vi. 100), N. L. B.]

Additions to the Tennessee Flora.

Cimicifuga racemosa (L.) Nutt. var. *cordifolia* (Pursh.) Gray. This plant grows in rich soil on a wooded bluff of the Tennessee River, about one mile below Knoxville. It was first collected by me in September, 1890; and, again, in the same month of the following year. So far as I know, this *Cimicifuga* has never before been found outside of North Carolina. It differs considerably from *C. racemosa* in its period of flowering, the latter being out of flower here by the first of July, usually earlier. It it entirely odorless, and is readily distinguished from the type by its large, cordate leaflets.

Meibomia ochroleuca (M. A. Curtis) Kuntze. I collected a single specimen of this *Meibomia* in a dry, open wood near Knoxville, August 29, 1890. I have never seen it since. The range of this species is thus extended west of the Alleghanies.

Alchemilla arvensis (L.) Scop., is abundantly naturalized in dry fields about Knoxville, It grows with *Trifolium procumbens*, var. *minus*, *Houstonia minima*, *Plantago heterophylla*, etc., and appears as if indigenous.

Antennaria plantaginifolia (Linn.) Hook, var. *monocephala*, Torr. and Gray.—Early in April, 1891, I came upon a peculiar form of *Antennaria plantaginifolia* growing on a bank in a wooded glen near Knoxville.

There were about thirty plants, all pistillate, growing with the ordinary form. I collected several specimens, but was unable to "place" the plant to my satisfaction, and laid it aside. A short time ago my friend, Prof. A. Ruth, sent a specimen to Dr. N. L. Britton for determination. By him it was referred to *A. plantaginifolia* (Linn.) Hook., var. *monocephala*, Torr. & Gray, heretofore known only from Louisiana. The variety differs from the type in several particulars. The single heads are about twice as great in diameter. The cauline leaves are narrower and more appressed and bract-like. The involucral scales are narrower and taper from near the base to the more or less acute apex. They are quite conspicuously marked with crimson below the scarious tips. In habit of growth and in size and form of the root-leaves, there seems to be no departure from the type. There were no transition forms among the specimens observed. If the characters above stated are constant, this *Antennaria* should be maintained as a good variety.

Lithospermum tuberosum, Rugel. Collected near Knoxville by Prof. F. Lamson-Scribner in April, 1890. In the same month of the following year, collected by myself on the summit of a wooded bluff, a short distance above Knoxville. Corresponds, in every particular, to Florida specimens of A. H. Curtiss' collection. Distribution, according to the Synoptical Flora, Fla. and Tex.

T. H. KEARNEY, JR.

UNIVERSITY OF TENNESSEE, Knoxville.

Aster leiophyllus, n. sp.

(PLATE CLVII.)

By the further study of living plants in the field and of dried specimens from new and distant localities; I am now convinced that the *Aster* published by me in the BULLETIN, xvi. 67, as *A. cordifolius*, L., var. *lævigatus*, is a distinct species, and, since *lævigatus* cannot be retained because of former use, I have chosen another name of similar meaning. Although the new species bears a general resemblance to *A. cordifolius* and sometimes grows with it, no forms intermediate have been discovered. The leaves, in the fresh state, are usually thickish and leathery, and perfectly smooth, with a greasy feel, but in the dried state are much thinner, when the raised veins on the under surface renders it somewhat roughish to the touch. The broadly-margined petioles are also strikingly characteristic, so that Dr. Gray, to whom the plant was sent a short time before his death, wrote me that he had never seen before an *Aster* with just such leaves.

No specimens of it have reached me from New England. As far as known its range extends from Southern New York and Northern New Jersey through Pennsylvania and Western Maryland to Eastern Kentucky and Ohio, but it is likely to be observed west and south of these limits.

Var. LANCEOLATUS (*A. cordifolius*, var. *lanceolatus*, Porter, BULLETIN, xvi. 68.

Var. INCISUS (Britton), *A. cordifolius*, var. *incisus*, Britton, BULLETIN, xix. 224.

To the stations for the latter given by Dr. Britton may be added Moosic Lake, Lackawanna County, Pa., where I collected it in 1884.

It may be of interest also to mention that two northern species of the same genus have been lately found in this neighborhood, *A. patulus*, Lam., at Bethlehem by E. A. Rau, and *A. amethystinus*, Nutt., on the Delaware near Easton, by A. A. Tyler.

THOMAS C. PORTER.

Botanical Notes.

Our Index to Recent literature relating to American Botany. An editorial in the "Botanical Gazette" for May makes flattering reference to this department of the BULLETIN, but expresses the wish that something more extensive and complete might be furnished for recording the writings of American botanists—something on the plan of Just's "Botanical Jahreshericht," which forms two thick octavo volumes each year, and is supposed to record and abstract all botanical writings the world over, but which has always been markedly deficient in its allusions to American publications, and which is always from 18 to 30 months behind the time.

The suggestion appears to us as a very happy one, and the present editors of the BULLETIN would gladly see it carried out.

The pressure on our pages for the publication of original matter is such that it has at times been seriously debated whether we ought not to abandon the "Index," and the labor of keeping it up and attempting to scan all the periodical literature of the day, has made most serious inroads upon our time. We believe that we have recorded the great bulk of botanical papers relating to American plants during the time the "Index" has been carried along (1886–1893), but that there have been noteworthy omissions is certain, and we have been forced to notice hundreds of articles by title only, which would have been abstracted, if there had been more time and space.

One method of carrying out the Gazette's suggestion, and it may be the most practical method, so far as the preparation of the material goes, would be for persons at each of the botanical centres to make themselves responsible for certain of the journals and society publications, abstract the papers therein and send the abstracts to a central point to be collated and arranged: the abstracts to be written on blanks prepared for the purpose. It would be necessary for some one to act as editor-in-chief, and that there should be a large number of abstractors as associates. The first thing to be done would be to ascertain just what periodicals were regularly received at each of the centres participating in the work, and then to assign the periodicals. The books and pamphlets printed as such would naturally be assigned to persons whose work lay along the lines of the subjects treated. As to publication, we conceive that this should be regularly conducted at intervals, say of three months, which would make in effect another botanical journal. The "Gazette" doubts that this would pay for itself from subscriptions. But would not this be an appropriate organ for the "Botanical Society of America," proposed by Professor Bailey at the Rochester meeting of the American Association, and for the organization of which a committee was then appointed? (See BULLETIN xix. 294.) We believe that there are as many as 200 botanists in America who would be willing to form such an organization with dues at five dollars per annum, which would provide an income of $1000 irrespective of sales, and the number of botanists in the country is steadily increasing. Such a sum as this would warrant the printing and distribution of 600 or 700 pages annually.

It is interesting to note that when the "Index" was commenced the "Gazette" expressed the hope that there would be sufficient matter to "keep this department always full, but we doubt it." (Bot. Gaz. xi. 66.)

Sphagna Boreali-Americana Exsiccata. Prospectus.—The undersigned propose to issue, about two years from the present time, sets of specimens of North American Sphagna. The number of species attributed to the United States and British America is now nearly fifty, and many of them have never been distributed.

Many of the species are represented by several varieties; so that for anything like a full series, there should be at least one hundred forms in the collection; perhaps one hundred and thirty would be a better estimate. It is proposed to prepare not less than sixty sets of the specimens, and to offer a set to each person who may supply three or more acceptable forms in quantity sufficient for distribution. The remaining sets will be used for foreign exchanges, and for sale at a price to be named hereafter. Promises of assistance have been received already from Mrs. E. G. Britton of Columbia College, Prof. John Macoun of Canada, Dr. W. A. Setchell and Dr. A. W. Evans of New Haven, Dr. A. W. Chapman of Florida, Mr. J. K. Small of Lancaster, Penn., Mr. Edward L. Rand of Boston, and others, and there is every reason to hope that the collection may be made to include nearly all the known species of temperate North America.

Most of the species the undersigned feel competent to identify; any that are in the least degree doubtful will be submitted to Dr. C. Warnstorf, the most learned living sphagnologist, for final determination.

A few hints as to preserving specimens may be offered. All the plants for one series of sixty specimens should be gathered at one time and place, to avoid the chance of mixing two different forms under one number. The plants of dense habits of growth should be separated into broad, thin specimens while fresh, cleaned of foreign matter, and preserved in botanizing portfolios in the usual manner, taking care not to subject them to any severe compression. Just enough pressure to keep them flat is enough. Floating plants, such as the plumose forms of *S. cuspidatum*, are best prepared by spreading the specimens on letter-paper, as is usual in preserving the more delicate seaweeds. If the collector has no means of pressing the specimens, they may be gathered in bulk, and, when air-dried, sent in packages to Professor Eaton, who can have them softened and spread out for drying at some convenient time. Care should be taken to note the place and time of each collecting, and the approximate height of the station above sea-level.

The coöperation of American Botanists is respectfully asked for; and letters or collections may be addressed to either of the undersigned. DANIEL C. EATON.

YALE UNIVERSITY, New Haven, Conn.

EDWIN FAXON.

317 LAMARTINE STREET, JAMAICA PLAIN, MASS., April, 1893.

Note on some Characeæ.—The first fascicules of the second part of the "Characeæ of America" was issued at the close of 1892. I omitted to affix any date, so that this notice seems necessary to secure priority for the new species therein described. *Nitella formosa*, Allen, described as a new species in this volume of the BULLETIN, p. 119, now turns out to be a form of *N. hyalina*, A. Br., related to *N. hyalina*, var. *Engelmanni*, A. Br., first described as *N. Engelmanni*, A. Br. I have recently had the opportunity to examine the Engelmann collection of Characeæ belonging to the Shaw School of Botany, in St. Louis. This collection is rich in types of A. Braun's species; it contains one fine specimen of *N. Engelmanni*, of which I have secured photographs.

T. F. ALLEN.

Ipomœa pandurata. Not long ago my attention was drawn to a huge root, which was unearthed by the workmen in the cemetery of this place (Springfield, Ohio). On examination it proved to belong to the above named species. This particular root is remarkable only for its size. I have never heard of the root of this species reaching the size of the one I am describing, therefore I think it worthy of record. Professor Gray says the root often weighs from ten to twenty pounds. The weight of the specimen here was found to be twenty-five pounds. The length was about two and a half feet, and the diameter over six inches at the thickest part. Flowers of this "Man-of-the-Earth" have been observed annually for twenty-nine years at the place where the root was dug up. A. F. LINN.

WITTENBERG COLLEGE, May 15, 1893.

Reviews of Foreign Literature.

De la Culture artificielle des Diatomees. Dr. P. Miquel. (Le Diatomiste, 1892–93, pp. 93–99; 121–128; 149–156; 165–172.)

In this series of articles just completed Dr. Miquel records, with great minuteness, the results of his experiments in propagating diatoms in the laboratory. He starts out by stating that in order to cultivate diatoms successfully, it is necessary to provide them with two kinds of food—saline food and organic food. Then follow formulæ for such nutritive fluids, and directions in detail for using them, together with suggestions as to light, temperature and sterilization of the culture fluid so as to prevent the growth of organisms which are inimical to the growth of the diatoms. The experiments include marine as well as fresh water cultures, and in the concluding article directions are given for the construction of culture cells, so that the various stages of growth may be watched under the microscope.

Not the least interesting portion of the paper is that which relates to the production of strange and abnormal varieties by varying the character of the culture fluid. These varieties Dr. Miquel calls "teratological growths." He states that he has followed them to the third generation, and describes some of the remarkable variations in form which resulted.

Within the last few years much attention has been given to the life history of diatoms, but no article bearing upon that subject has lately appeared that is likely to attract more attention than this. Dr. Miquel's experiments have suggested new lines of research, and they will doubtless be reported by other diatomists. The results of these observations will be watched with interest. The experiments in regard to "teratological growths," in particular, may clear up much of the present obscurity in regard to species, and may result in bringing together many now regarded as distinct.

C. H. K.

Beitrage zur einer Monographie der Gattung Habenaria, Willd. F. Kranzlin. (Engler's Bot. Jahrb. xvi. 52–223.) This contribution towards a monograph of the genus *Habenaria* enumerates 347 species, mostly South American, African and Asiatic. The only species noted for the United States are two Southern species, *H.*

quinqueseta (Mx.) under the name *H. Michauxii*, Nutt., and *H. repens*, Nutt.

An interesting question in nomenclature is suggested by the author's use of *H. fimbriata*, Wight, for a species of the East Indies. Wight in 1852 adopted this name apparently under the impression that the *Platanthera fimbriata* of Willdenow, applied to a different genus, which would leave him at liberty to use it for *Habenaria*. But the name *fimbriata* must be rejected both in this case as well as in the case of our own *fimbriata*, so-called, as it was employed by Aiton in 1813 as a synonym of *H. psycodes* (L.), Asa Gray. T. M.

Rabenhorst's Kryptogamen Flora, Part 21, pp. 449–512 (1893), Mniaceæ and Meeseaceæ. Several changes in the genus *Mnium* which affect our North American species are of interest: *M. Seligeri*, Milde (1869), and *M. rugicum*, Laurer (1827), are separated from *M. affine*, Bland, the leaves of the former being long-decurrent at base with the marginal teeth one-celled, the second indistinctly toothed with base short-decurrent, and the last also short-decurrent, but the teeth composed of 2–4 cells. None of the older names adopted by Lindberg are accepted. E. G. B.

Proceedings of the Club.

TUESDAY EVENING, MAY 9TH, 1893.

The President in the chair and 32 persons present.

Miss Gertrude Appleby, of New York, was elected an Active Member.

The committee appointed at the meeting of April 11th, 1893, to draw up a suitable minute regarding the death of M. Alphonse De Candolle for publication in the proceedings of the Club, presented the following report, which was accepted:

M. Alphonse De Candolle, an Honorary Member of this Club and one of the most eminent botanists of our time, died at Geneva, Switzerland, April 4th, 1893, in the 87th year of his age.

He was born at Paris, but resided most of his life in and near Geneva. He was a son of the equally famous Augustin Pyramus De Candolle, and was associated with him in much of the botanical work that has made the family name a household word in the science of all countries.

On the death of his father in 1841 he succeeded to the authorship and editorship of the "Prodromus systematis naturalis regni vegetabilis," the great work in which the elder De Candolle hoped to concisely describe all the known plants of the world, his name appearing on the title page of the eighth volume, issued in 1841, and continuing up to the issue of the seventeenth, in 1873, when the work was abandoned, its place being taken by the "Monographiæ Phanerogamorum," a series of seven thick volumes of which has been printed. Among his earliest works is the noteworthy "Monographie des Campanulées," a quarto of 384 pages and 20 plates, issued in 1830, M. De Candolle being then but 24 years old. In later years he devoted himself to the study of geographical distribution, and in 1855 his "Geographie botanique raisonée" appeared in two volumes of 1366 pages. He was the moving spirit in the International Botanical Congress, held at Paris in 1867, when the modern laws of botanical nomenclature were framed; and if these had been carried out in the way they were intended, there would have been no necessity for the recent movements to secure a stable system of plant names. More recently he has critically investigated the origin and history of cultivated plants, and published numerous papers on this subject, bringing together in his "Origin of Cultivated Plants," in 1882, about all the reliable information that was then extant.

In view of the loss which botanical science has experienced by his death, we recommend the adoption of the following resolution:

Resolved, That by the death of Alphonse De Candolle, after a long life rich in contributions to the knowledge of mankind, botanical science has suffered an irreparable loss; and

Resolved, That the sympathy of the TORREY BOTANICAL CLUB is extended to the family of the deceased savant.

N. L. BRITTON,
HENRY H. RUSBY,
Committee.

The Acting Secretary directed attention to the prospectus of the Hodgkins Fund Prizes for investigations and essays on the nature of atmospheric air, issued by the Smithsonian Institution.

Mr. Small exhibited specimens of *Catharinea crispa* from Atlantic Highlands, N. J., adding another to the few localities known for this moss. It occurred in abundance at this station.

Mr. Theodore G. White read a paper entitled "Preliminary Notes on the North American Species of *Lathyrus*," illustrated by specimens. The paper was discussed by Judge Brown and Dr. Morong.

Dr. Britton delivered an illustrated lecture on the "Structure and Classification of Grasses."

WEDNESDAY EVENING, MAY 31ST, 1893.

Vice-President Morong in the chair and 21 persons present.

Dr. Morong exhibited fruits of the Doum palm, *Hyphæne Thibetica*, brought by Miss Vail from Egypt; also a fruit of *Mauritia flexuosa*, the Miniti or Ita palm of Brazil.

Dr. Britton remarked on *Pyrola oxypetala*, Austin, known only from the original station at Deposit, Delaware County, N. Y., and exhibited one of the type specimens. He also stated that in company with Professor Porter he had observed at the Nockamixon Rocks, Bucks county, Penna., on May 30th, *Senecio aureus*, L., and *Senecio Balsamitæ*, Muhl, growing side by side in a marshy meadow; the former was in full bloom, while the latter showed no signs of expanding its involucre. He maintained that it is a distinct species, and not a variety of *S. aureus*.

Dr. Britton also showed a copy of a pamphlet entitled "The Torrey Festival," which contains an account of the proceedings at the dinner given to Dr. Torrey, December 20, 1867, by the Botanical Club of New York, under which name the Torrey Botanical Club first met, in commemoration of the completion, in 1817, of the "Catalogue of Plants Growing within Thirty Miles of New York."

The announced paper of the evening was by Mr. John K. Small and Miss Anna Murray Vail, on "A Report of the Exploration of Southern Virginia during the Summer of 1892." Herbarium specimens of the more interesting species collected were shown, among them some 12 new to the range of Gray's Manual. The paper will be published in the MEMOIRS.

Mr. Lighthipe reported *Lupinus perennis* with white flowers from near Princeton, N. J., *Helonias bullata* from the same locality, and *Mertensia Virginica* from Rocky Hill, N. J.

Dr. Morong reported *Silene Pennsylvanica* with white flowers from Woodhaven, Long Island.

A general discussion on the occurrence of albinism followed, in which remarks were made by Dr. Morong, Miss Vail, Mrs. Britton and Mr. Lighthipe.

Index to Recent Literature Relating to American Botany.

Adventitious Budding in Æsculus Hippocastanum. Walter C. Kerr (Proc. Nat. Sci. Assoc. Staten Island, April 8, 1893).

Ascyrum Crux-Andreæ (Meehan's Month, iii. 65).

Bacteria in Vegetable Tissue—Non-Parasitic. H. L. Russell (Bot. Gaz. xviii. 93).

Beitrage zur Kenntniss exotischer Sphagna. C. Warnstorf. (Hedwigia, 1893, 1–17, plates i–iv. reprinted).

Several corrections of American specimens and species are made, and all those who have been sending material to Dr. Warnstorf for naming will do well to consult this publication. Several changes are made in Macoun's Canadian mosses, and the range of several species is extended. *S. Labradorense*, Warnst., *S. Lindbergii*, Schpr., *S. Floridanum*, Cardot, *S. Mendocinum*, S. & L., *S. Dusenii*, C. Jensen, *S. Girgensohnii*, Russ., var. and *S. Garberi*, L. & J., are described and figured.

Botanical Laboratory in Pharmaceutical Manufacture—The work of a. John S. Wright (Science xxi. 183).

Botanical Notes from Texas. E. N. Plank. (Gard. and For. vi. 162.) Notes on *Sesbania Cavanillesii, S. vesicaria, Oxalis dichondræfolia, Prunus Caroliniana, Xanthoxylum Fagara, Clematis Drummondii* and others.

Botanical Survey of Nebraska. Report on Collections made in 1892 (pp. 46, Univ. Neb. 1893).

This pamphlet contains (1) Flora of the Sand Hill Region of Sheridan and Cherry Counties, and List of Plants collected on a Journey through the Sand Hills in July and August, 1892, by Jared G. Smith and Roscoe Pound, including sixteen plants new to the State; (2) Notes on the Canon Flora of Sioux County with List of Plants collected in July and August, 1892, by A. F. Woods, with some twenty additions to the State Flora, *Volvaria viscosa*, Clements and *Mycena acutoconica*, Clements, being two new Fungi; (3) Miscellaneous Additions to the Flora of the State, and new or noteworthy Species from various Localities including *Coprinus granulosus*, *Inocybe tuberosa*, *Pholiota speciosa* and *Lepiota avellanea*, new species described by Mr. Clements.

Bouteloua—Les Fleurs des. H. Baillon (Bull. Mens. Soc. Linn. Paris, i. 1087, 1088).

Brasenia peltata, Pursh—The Glandular Hairs of. Ida A. Keller. (Proc. Acad. Nat. Sci. Phila. 1893, 188).

Calypso borealis (Gard. Chron. xiii. 421).

Carex baccans C. B. Clarke (Bot. Mag. t. 7288).

Carnivorous Plants—Recent Studies of. Jared G. Smith. (Am. Nat. xxvii. 413).

Catabrosa aquatica—Les Fleurs du. H. Baillon (Bull. Mem. Paris, i. 1072).

Cattleya iricolor. (Bot. Mag. t. 7287).

Chara—Description of a new fossil Species of. F. H. Knowlton (Bot. Gaz. xviii. 141–142; illustrated).

Chara Stantoni. From the Upper Cretaceous of Wyoming.

Contribution to the Biology of the Organism causiug Leguminous Tubercles. Geo. F. Atkinson (Bot. Gaz. xviii. 157–166; three plates).

Corallorhiza—The Genus. M. B. Thomas (Bot. Gaz. xviii. 166–170 two plates).

Cretaceous Plant Population—The Probable Physiognomy of the. Conway McMillan (Am. Nat. xxvii. 336).

Cypripedium Chamberlaini. W. H. Gower (Garden, xliii. 304 with colored plate).

Cypripedium spectabile.—Is it poisonous to the touch? Henry J. Jesup (Bot. Gaz. xviii. 142–143).

Referring to a note in the BULLETIN, vi. 15, Prof. Jesup adduces facts in support of the theory that this plant may excite symptoms similar to poisoning by *Rhus*.

Datos para el estudio de la produccion del Chicle. Fernando Altamirano (El Estudio, iv. 251).

With illustration of *Asclepias laungmosa*, H. B. K.

Decay in the Apple Barrel. B. D. Halsted (Pop. Sci. Month. xliii. 76, illustrated).

Enumeration of the Plants collected by Dr. Thomas Morong in Paraguay, 1888–90. By Thomas Morong and N. L. Britton with the assistance of Miss Anna Murray Vail. Contributions from the Herbarium of Columbia College, No. 35 (Annals New York Acad. Sci. vii. 45–280).

This handsomely printed volume of 235 pages describes that portion of the Paraguayan flora which was collected by Dr. Morong during a recent visit of two years to that country. In the course of that time the region within a hundred miles of Asuncion, and the uninhabited portions of the Gran Chaco wilderness, for 400 miles up the little known Pilcomayo River, was very thoroughly searched. The collection, including the Mosses, foots up not quite 1000 species, nearly one-tenth of which are new. It represents 106 orders, the most numerous being the Compositæ, Leguminosæ, Gramineæ, Cyperaceæ, Euphorbiaceæ, Solanaceæ, Malvaceæ and Filices, which are the most common orders in South America. Of the five species of Palms enumerated, two are described as new to science; of the thirty-six Euphorbiaceæ, five; of the ten Myrtaceæ, four; and of the ten Asclepiadaceæ, five, the most remarkable, perhaps, being the last. The new species are described by Drs. Britton and Morong, and all the determinations were made after a careful comparison of the plants with the collections at Columbia College and Kew. In this labor the authors were assisted by such eminent European botanists as J. G. Baker, Edmund Baker, A. Cogniaux, N. E. Brown, M. T. Masters, A. Franchet, Casimir De Candolle and R. A. Rolfe, so that there is every reason for regarding the identification of the species as correct. A large part of the value of this enumeration lies in the notes, which are very full. The peculiarities of nearly all the species named in measurement, color, habitat, habit, and other interesting particulars concerning their economical uses and surroundings, are taken from the field notes of Dr. Morong, which were made while the specimens were fresh, and after many inquiries made among the natives of the country as to the local names and uses. There is scarcely a species given which might not at once be identified by any visiting botanist from these notes here given, so that future explorers of this region will have an easy time of it, so far as this enumeration goes.

It should be placed on record as a happy circumstance that a North American botanist in this distant and not easily accessible South American country should have met with such remarkable success as attended the work of Dr. Morong. After a voyage of seventy days across the Atlantic, in which not a single storm occurred, and after a sojourn of two years, much of it spent in a remote wilderness inhabited only by roving Indians and wild animals, with not a mishap or a single day's illness to detract from his good fortune, the collector circumnavigates the South American continent, and returns to his own land in perfect health. Of the 12,000 or more specimens collected, not one is lost, and within three years from the time of his return the whole collection is collated, enumerated and published—a fact which is thought to be without a parallel. A. H.

Enumeration of the Plants collected in Bolivia by Miguel Bang with descriptions of new Genera and Species. Henry H. Rusby (Mem. Torr. Bot. Club, iii. pp. 67; issued April 27, 1893).

The collections made by Dr. Rusby in Eastern Bolivia during the years 1885 and 1886 proved so rich in novelties, and in species hitherto very little known, that he determined, if it should become possible to supplement his material by additional specimens from the same region, and this was the more especially desirable from the fact that owing to the conditions under which Dr. Rusby made his way through the country, he was able in many instances to bring away but a single specimen of a species. Opportunity for continuing his work was afforded in 1889 by the engagement of Miguel Bang, a Danish gardener of La Paz, to collect material in bulk and ship it to New York. The results have more than justified the arrangement, for in addition to securing some of the best things obtained by Dr. Rusby a very large number of additional new species have been obtained, and most of them in sufficient quantity to make up twenty complete sets, which have been placed in the principal herbaria of America and Europe.

The present paper enumerates the Polypetalæ and Gamopetalæ up to Lobeliaceæ of Mr. Bang's numbers from 1 to 1000, and describes 90 species as new, besides defining a number of *nomina nuda.* The remainder of the plants included between these numbers will form a second paper, to be issued in the autumn of the present year on Dr. Rusby's return from Europe, where he is now engaged in making comparisons with named material at Kew and Berlin, and subsequent papers will complete the account of the collections, the accumulation of which, it is hoped, will continue over several years longer. Mr. Bang's numbers have now reached about 2000, and taken together with Dr. Rusby's collection represent over 3500 species. These, with the collections of Mandon and Weddell, the best sets of which are in the Paris Herbarium, and those of Pearce and Pentland at Kew, probably indicate about 5000 species from Bolivia. Dr. Otto Kuntze has recently made some collections in the territory, and we understand is now engaged in their determination. It is a cherished plan of Dr. Rusby and the writer to ultimately bring an account of all this material together in the form of a Flora of Bolivia; but time alone will show whether this enterprise can be brought to a successful termination. N. L. B.

Erythronium—The Range of Variation in Species of. M. E. Meads (Bot. Gaz. xviii. 134–138; one plate).

Flora of Montreal Island—Changes in the. Robert Campbell (Can. Record Sci. v. 294).

Forests of the South—The. Henry L. Tolman (Gard. and For. vi. 158).

Fossil Diatoms in Philadelphia beneath the New Girls' Normal School Building—Marine clays overlying fresh-water clays at some other localities. Lewis Woolman (Microscopical Bulletin, ix. 33–34).

The author calls attention to the fact that in most of the clays that lie immediately beneath the surface of the old city proper, and which have an elevation of less than 40 feet above mean high tide, there is a considerable showing of sponge spicules and diatoms. The diatoms are both fresh-water and marine, the latter predominating. There is given a list of 31 species from the deposit at Thirteenth and Spring Garden streets, found thirteen feet beneath the surface. C. H. K.

Frost Freaks of the Dittany. Lester F. Ward (Bot. Gaz. xviii. 183–186; one plate).

Note on *Cunila Mariana* as a "frost-weed."

Galinsoga parviflora in Italia—Sulla. P. Bargagli (Bull. Soc. Bot. Ital. 1893, 151).

George Vasey: A Biographical Sketch. Wm. N. Canby and J. N. Rose (Bot. Gaz. xviii. 170–183, with portrait).

Habenaria fimbriata. Henry G. Jesup (Bot. Gaz. xviii. 189, 190, illustrated).

Note on flowers of this species with the lip entire

Hardwood Trees of Illinois—Notes on the, VI., VII. J. Schneck (Hardwood, iii. Nos. 4, 5).

Herbarium—The Growth of the General. (Quarterly Bull. Univ. Minn. i. 70.)

How to Know the Wild Flowers. Mrs. William Starr Dana, illustrated by Marion Satterlee (298 pages, 1893, Chas. Scribner's Sons).

This attractive little book merits the success which it has already met with, not only for its numerous and excellent illustrations, but for the clear and simple descriptions of our common flowers, as well as for the interesting information of a scientific or literary nature. The arrangement is by colors, and seasons and the habits, uses and popular names receive due mention. There are 104 full-page illustrations, which alone would make it easy to recognize most of the pretty wild flowers. E. G. B.

Hybrid Oak—Another. A. S. Hitchcock (Bot. Gaz. xviii. 110; with plate). The record of the discovery of an interesting tree near Manhattan, Kansas.

Hymenomyceteæ of Orleans Co., N. Y. Chas. E. Fairman (Proc. Rochester Acad. Sci. ii. 154). 126 species are catalogued.

Lagoa Santa (Brezil) Etude Geographique Botanique. Eug. Warming (Rev. Gen. de Bot. v. 145; with illustrations).

Lepismium Knightii, Pfr. (Monats. Kakteenk. iii. 40; with illustration).

Liliaceens Brasiliens—Die Officinellen. Theodor Peckholt (Pharm. Rundsch. xi. 80).

Marantaceæ nonnullæ Ecuadorienses. H. Eggers (Bot. Centralbl. liii. 305). *Calathea Petersenii, C. Sodiroi* and *Ischnosiphon Morlæ* are described as new, and two of the species illustrated.

Mitchella repens. (Meehan's Month. iii. 49, with colored illustration.)

Mexico—Additions to the Phænogamic Flora of. B. L. Robinson and H. E. Seaton (Proc. Am. Acad. Arts and Sci. xxviii. 103).

New species are described in the genera *Thalictrum*, *Polygala*, *Abutilon*, *Pavonia*, *Astragalus*, *Stylosanthes*, *Cotyledon*, *Sedum*, *Cuphea*, *Fuchsia*, *Cyclanthera*, *Piqueria*, *Stevia*, *Eupatorium*, *Brickellia*, *Sabazia*, *Verbesina*, *Tridax*, *Schkuria*, *Senecio*, *Cacalia*, *Cnicus*, *Perezia*, *Lobelia*, *Arctostaphylos*, *Gentiana*, *Halenia*, *Krynitzkia*, *Russelia*, *Castilleia*, *Pedicularis*, *Dicliptera*, *Salvia*, *Spiranthes*, and *Dioscorea*.

Monilia fructigena—On. James Ellis Humphrey (Bot. Gaz. xviii. 85, with plate).

Myxomycetes—On two new or imperfectly known. W. C. Sturgis (Bot. Gaz. xviii. 186, 187, one plate).

Description and illustration of *Comatricha cæspitosa*, n. sp., and *Physarum sulphureum*, Alb. & Schw.

Naiadaceæ of North America. Thomas Morong (Mem. Torr. Bot. Club, vol. 3, No. 2, pp. 65, 55 plates; issued March 15, 1893).

So little has been done with the order named above, since the work of Chamisso in Linnæa, vol. 2, 1827, and the 3d Mantissa of Roemer and Schultes, which appeared after the Linnæa, though in the same year, that one feels constrained to welcome a publication on it, especially coming from an author who has studied it for many years; and if we cannot agree in all points with him, we at least know it is the outcome of honest work and ripe judgment.

The difficulties attending the order, especially its principal genus (*Potamogeton*), are by no means small, and while we advance slowly in the acquired knowledge of it, it may be trusted, that it is sure.

In another place (*) I have mentioned more particularly the geographical distribution of Dr. Morong's Monograph, and I propose to take up some other points here.

The question of hybrids has lately been much written on in Great Britain, and while it would be ridiculous to deny the existence of natural hybrids, I do not believe they are as common as asserted. Of course, those who support it have a strong position, as it is exceedingly difficult to prove they are not, without years of careful work. I have myself made bees produce hybrids between *Verbascum floccosum*, and *V. Thapsus*, L., and when these hybrids flowered I found the bees showed evident preference for their flowers, over those of either parent. In *Potamogeton* I have attempted to hybridize with several species, but as yet without success. I have had plants named as continental hybrids for Britain, one of whose supposed parents does not exist as an indigenous species (or otherwise ?) in our own country; this is met by the hybrid-man by supposing that its parent did exist but has died out. Geology clearly tells us that many species did exist in many parts where they certainly are not known to exist now, so here again we have a difficulty to find an adequate answer, and the query of proof is greater still. Within easy walk of my home *Potamogeton densus*, *P. perfoliatus* and *P. crispus* grow in a mill-head, and adjacent stream in beds intermixed, yet for twenty years I have never seen a specimen that I could not refer with safety to either species. The water is in rather rapid movement, I admit, and doubtless a still ditch or pond would be more likely to produce hybrids, especially if teeming with pond-life; but the fact remains that the three species are in actual and continuous contact.

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* Journal of Botany, 1893.

After hybrids, the question of species naturally occurs to one. No one ever has, and probably never will, be able to define what constitutes a species. Mr. H. C. Watson, in his various works on the geographical distribution of the British Flora, attacks the species maker very severely, but he owns it is because it interferes with the collation of other Floras, and with the certainty of the plants so-called being separated by other botanists, and so leading to errors in recorded distribution. The difference between a species of Bentham, and one of Gandoger is very great, and while the one overlooks natural distinctions, the other creates impossible differences. Looking through Dr. Morong's Monograph with these matters before one, what seems to present itself, is; that in the other genera, such as *Ruppia*, and *Zannichellia*, Dr. Morong is less given to divide than in *Potamogeton*, yet if we carefully contrast the characters of *P. pectinatus*, and *P. latifolius*, Morong, they seem less striking than those between some of the above named two genera.

We miss "*P. plantagineus*, Du Croz, var. *Jamaicensis*," Griseb. which occurs in St. Domingo, and Hog Island, Bahamas fide Baker in Herb. Kew. I have not seen this variety in fruit, though the general habit and texture of leaves are certainly like Du Croz, plant, which, however, must bear the name of *P. coloratus*, Hornm. (1813).

P. occidentalis, Sieb., *P. fluitans*, Griseb, is another not named, occurring in Porto Rico; St. Domingo, Jamaica, Martinique and Cuba.

Dr. Morong considers me in error in saying "I believe *P. Nuttallii*, Cham., to be *P. Oakesianus*, Robbins." Perhaps he is right, but I have never yet been able to trace the specimen on which Chamisso founded the species.

The query as to the name *P. Claytonii*, Tuck., must bear will, I think, be disposed of by its being hereafter found that it is represented by *P. ephydrum*, Rafinesque (1808); if so, this will long antedate any other name.

I am thoroughly in accord with the writer in retaining at present Tuckerman's *P. lonchites*. It has yet to be shown what the two or three? forms passing under the name of *P. fluitans*, Roth, in Europe represent; and though a certain amount of feeling has been imparted into the *fluitans* discussion, this neither helps on the truth or theme; only patient work will elucidate these difficulties. But in the next, *P. Faxoni*, I cannot agree with Dr. Morong. Certainly different plants have been distributed, with but two specimens seen by me, and on which I grounded the opinion quoted by Dr. Morong, the upper leaves might well have been taken off *P. Claytonii*, and the leaves were about identical with Irish specimens of *rufescens;* while later specimens I am unable to seperate from *lonchites*.

The hybrid difficulty is well shown by *P. spathulæformis*, Morong. Here what certainly seems a certain amount of injustice to Dr. Morong comes in, because the mere fact of publication by Mr. Fryer of Dr. Morong's herbarium name of *P. varians* constitutes the name of the plant without doubt, if recognized as a species, and we must write *P. varians*, Fryer.

As to *P. Illinoensis*, I quite agree with Mr. Fryer in joining this to the *lucens* group, in contradiction to Dr. Tiselius, who puts it to *P.* (*fluitans*) *lonchites*.

The very puzzling specimens from Wenham Pond, Mass., would, I think, be placed to *P. undulatus*, Wolfgang (*P. perfoliatus* × *crispus*, according to Mr. Fryer); but here comes in a very important question: supposing this to be an admitted fact, and also admitting that *P. crispus*, L., is an introduced plant to U. S. A., then the Wenham plant must be a very recent production of hybridity; the plant will well bear careful study.

It would be a matter of some interest to trace back to the earliest date possible the specimens of *P. crispus* gathered in North America; my friend, N. C. Melvill, has a specimen from "Philadelphia, 1841–2," gathered by "Gavin, Wakon and Kilvington." In marking a map of the world (on Mercator's projection) with the localities of *P. crispus*, it will at once be seen that, leaving the United States localities out, all fall within the right hand side of the 10° of west longitude. On the one hand, the British Isles seem the nearest to North America; on the other, Queensland in Australia. I have not seen it from New Zealand. It is certainly the most likely species to become transported to other lands, by its hardened winter-buds, which will equally bear exposure on dry mud or being frozen in ice. My friend, Mr. Straher, informs me that he finds that wherever horses have access to ponds there *P. crispus* is found, but where they are fenced round and not accessible to them, he has never found it; this is the result of the examination of a large number of ponds in Surrey. I cannot myself say I have ever noticed this, and it should be verified over a larger extent of country.

Dr. Morong makes the *P. pusillus*, var. *major*, Fries, into a species, under the name of *P. major* (Fries) Morong. To this I cannot assent, as there is already an undoubted specific name in *P. Friesii*, Ruprecht, of which I have seen numerous specimens from Ruprecht's own hand. I cannot say that I see the need of dropping *P. hybridus*, Michx., because Pentagna (not Thuillier), in Inst. Bot. 2, p. 289. 1787, so named a plant which is not Michaux's.

P. pectinatus, L., and its allied species, or what we choose to call them, will give plenty of work to botanists for some time.

Applying Dr. Morong's own test, his name *P. latifolius* is not admissible, as Robbins overlooked that there was already a *P. pectinatus*, var. *latifolius*, Meyer, Ch. Hann (1836), therefore his name could not be admitted, and being an error at first must not be reproduced.

There are some forms of *pectinatus* that the author has not entered, *i.e.*: *P. tenuifolius*, H. B. K., "New Mexico;" *P. angustissimus*, H. B. K., "Mexico," and *P. vaginatus*, Turcz., "Saskatchewan, Bourgeau, 1858." *

Doubtless the genera *Ruppia* and *Zannichellia* will bear further study the world over. Under *Zostera* there is another innovation in nomenclature that we cannot pass by. If Dr. Morong in 1886 was uncertain of the rank his *Z. latifolia* should bear, and he does not feel certain until 1893 of its specific rank (or anyhow has not published so), then I maintain that Watson's *Z. Pacifica* (1891) must take precedence.

Lastly, but not leastly, are the plates to be named; how they were done, and the Monograph produced at the price is a puzzle only our good friends themselves can solve.

That they will be of immense use in America especially, goes without saying; the large majority of them are characteristic of the forms they represent; to me, the least so, is that of *P. confervoides*, Reich. (*P. Tuckermanni*, Robbins). Doubtless Dr. Morong meant them to be popular (I mean in the scientific sense, not paste and scissors one), and they fully bear out these requirements. I warmly congratulate my good friend on this publication, and trust that at no distant date a second edition may be called for, and if so, we in Europe will do our best to help its author. The domain of science is the seeking of truth; and petty jealousies are the most miserable outcome possible of it—this all who love nature for herself should ignore.

ARTHUR BENNETT.

Newfoundland and Labrador Plants. A. C. Waghorne (pp 3. 1893).

This is a prospectus of sets of plants collected by Rev. Mr. Waghorne in Newfoundland and on the Labrador, and now offered for sale. A list of the species of *Sphagnum* is appended. His address is New Harbor, Newfoundland.

Notes on Canadian Bryology. N. C. Kindberg (Ottawa Nat. vii. 17-23). *Andræa sparsifolia*, Zett. var. *sublævis*, *Dicranowcisia obliqua*, *Dicranella polaris*, *D. cerviculatula*, *Leptotrichum tomen-*

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* Kihlman in Bot. Notiser, p. 85 (1887).

tosum, *Racomitrium fasciculare*, Brid. var. *haplocladon*, *Mnium glabrescens*, *Leskea Moseri*, *Anomodon platyphyllus*, *Pseudoleskea atricha*, *Thuidium pseudo-abietinum*, *Th. abietinum pachycladon*, *Isothecium myosuroides brevinerve*, *and I. hylocomioides*, *Eurhynchium subscabridum*, *E. subintegrifolium*, *E. Revelstokense*, *E. serrulatum cricense*, and *E. hispidifolium*, *E. pseudoserrulatum*, *Raphidostegium pseudorecurvans*, and *Hypnum Alaskæ* are described as new.

Notes on Mexican Travel i. ii. iii. C. G. Pringle (Gard. & For. vi. 172, 182, 203).

Notes on North American Trees, xxx. C. S. S. (Gard. & For. vi. 130).

The author claims *Anamonis dichotoma* as the older specific name for the tree known as *Anamonis punctata*.

Notes on the Hardwood Trees of Illinois. J. Schneck (Hardwood iii. No. 6).

Notes on the Staten Island Flora. Wm. T. Davis (Proc. Nat. Sci. Assoc. Staten Island, April 8, 1893).

Nouvelle Note sur l'Aciachne. H. Baillon (Bull. Mens. Soc. Linn. Paris, i. 1073).

Novitates occidentales—II. Edw. L. Greene (Erythea, i. 105–107). *Lathyrus violaceus*, *L. lætiflorus*, *Tellima tripartita*, *Tissa Talinum* and *T. valida* are characterized as new.

Passiflora cærulea.—The Tendrils of. D. T. MacDougal (Bot. Gaz. xviii. 123–129).

This is the second part of the paper, continued from the same journal, vol. xvii. p. 205).

Quercus macrocarpa—The over-cup Oak. J. T. Rothrock (Forest Leaves, iv. 22, illustrated).

Ranunculaceæ—A Comparative Study of the Roots of. Fred. B. Maywell (Bot. Gaz. xviii. 97, cont. from p. 47 with two plates).

Rhipsalis—Beschreibungen neuer Arten der Gattung. K. Schumann (Monats. Kakteenk. iii. 33).

Rhodochytrium, nov. gen. Eine Uebergangsform von den Protococcaceen zu den Chytridiaceen. G. A. Lagerheim (Bot. Zeit. ii. 43, with one plate).

Rytidosperma—Sur le. H. Baillon (Bull. Mens. Soc. Linn. Paris, i. 1088).

Salix balsamifera. O. A. Farwell (Gard. and For. vi. 149).

Segregation of Trees—On the Local. Robert Ridgway (Gard. and For. vi. 148).

Solanum nigrum. L.—Sulle forme di. A. Goiran. (Bull. Soc. Bot. Ital. 1893, 180).

Southern Appalachian Hardwoods. III. H. B. Wetzell (Hardwood, iii. Nos. 5, 6).

Spore—The Limitation of the Term. Conway MacMillan (Bot. Gaz. xviii. 130–134).

Table Mountain Pine—The. Thos. C. Porter (Gard. and For. vi. 204). Note on the distribution of *Pinus pungens.*

Tæniopteroid Fern and its Allies—A New. David White (Bull. Geol. Soc. Am. iv. 119–132, pl. 1).

A new species, *Tæniopteris Missouriensis*, from the Lower Coal Measures of the Carboniferous in Henry Co., Mo., is described and figured, with notes on its probable generic and specific allies, and a diagramatic presentation of the supposed genæology and relations of the group, beginning with the Lower Devonian *Megalopteris* and terminating, in its greatest extension, with *Danæa* in the Jurassic. It appears to be intermediate in its characters between *Tæniopteris* and *Alethopteris.* A. H.

Thuidium intermedium, Philibert (Revue Bryologique, xx. 33, 1893).

Six pages are devoted to the group of *Thuidium tamariscinum* including *T. delicatulum*, *T. recognitum*, and a new species, *T. intermedium*, characterized by revolute leaf margins like *T. delicatulum*, with the veins of the stem-leaves disappearing in the middle of the leaf, the terminal cell papillose, as in our two American species, the perichætium not ciliate as in *T. recognitum*, and the annulus persistent, of indistinct, small, square cells as in *T. tamariscinum.* An excellent key accompanies the description.
E. G. B.

Tillandsia angusta der Flora Fluminensis—Die. Fritz Müller (Ber. Deutsch. Bot. Gesell. x. 447–451).

A description of this Brazilian plant referred by Mez to the genus *Hohenbergia.*

Trematocarpus—Ueber der Gattung. A. Zahlbruckner (Verh. k. k. zoöl.-bot. Gesell. Wien, xliii. Sitzungs. 6, 7).

Trichopila sanguinolenta (Bot. Mag. t. 7281). Native of Equador.

Trichophilus Neniæ eine neue epizoische Alge. G. de Lagerheim (Ber. Deutsch. Bot. Gesell. x. 514–517).

Vegetation of Hot Springs. J. Christian Bay (Bot. Gaz. xviii. 187–189).

Vegetation of the Summit of Mount Hamilton. Edw. L. Greene (Erythea, i. 77–97).

A list of 212 species collected and observed about the Lick Observatory. Prof. Greene refers *Gomphocarpus tomentosus*, A. Gray, to *Asclepias* as *A. Californica*, and makes several other changes in nomenclature. The enumeration abounds in critical notes.

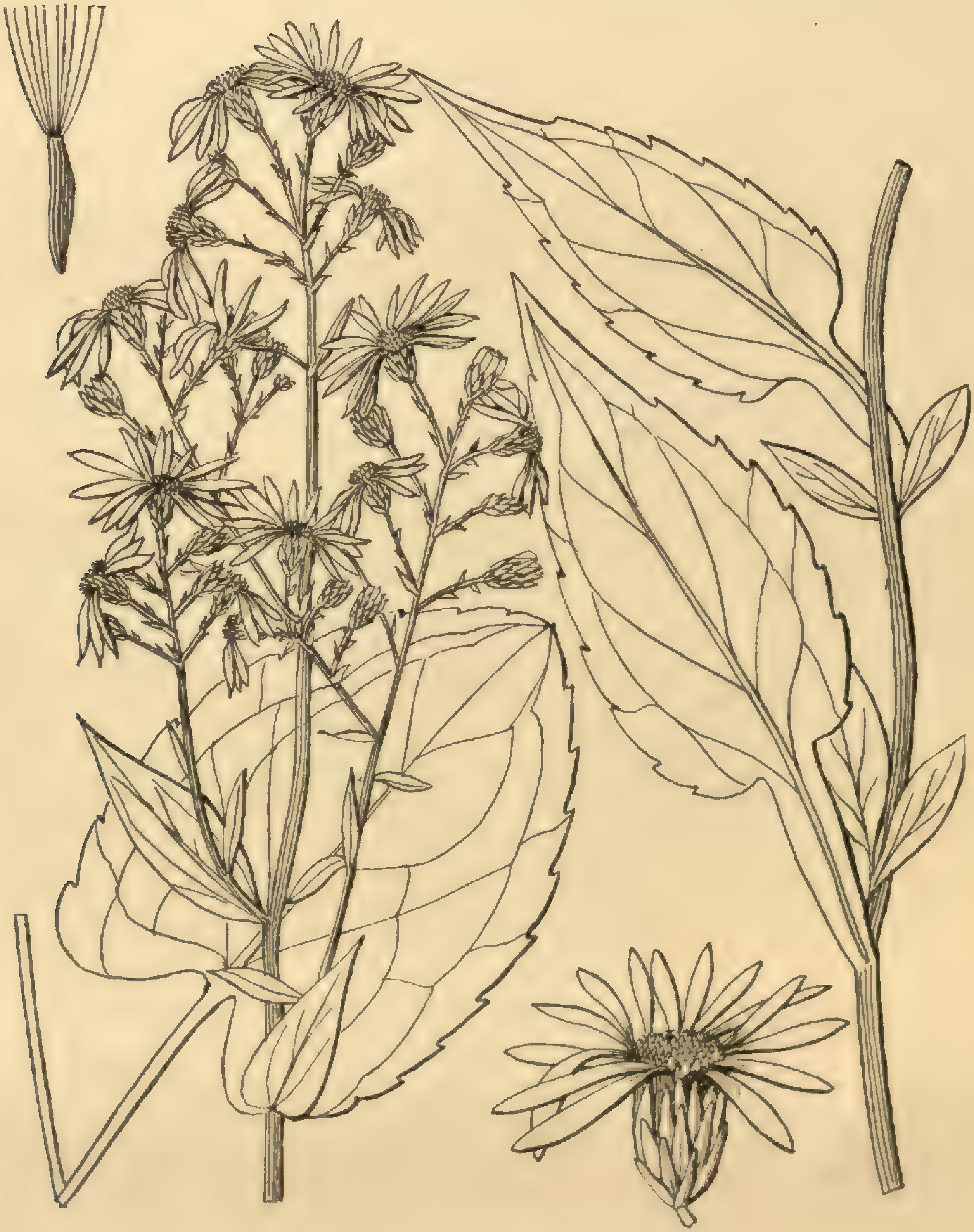
White Variety of the Fireweed. A. F. Winn (Can. Record Sci. v. 300).

Note on *Epilobium spicatum* forma *canescens.*

Umbelliferæ—Studies in Californian. II. W. L. Jepson (Erythea, i. 62, 63).

Yuccas and their Pollination—Further Studies of. Wm. Trelease (4th Ann. Rep. Missouri Bot. Gard. 181–226; twenty-three plates).

Record of a large number of observations on various species, supplementary to the work of Dr. Engelmann and Prof. Riley. The name *Y. glauca*, Nutt in Frazer's Cat. (1813) is adopted in place of *Y. angustifolia*, Pursh (1814).



ASTER LEIOPHYLLUS, PORTER.

Contributions from the Herbarium of Columbia College.

No. 1. A Preliminary List of North American Species of *Cyperus*, with Descriptions of New Forms. By N. L. Britton (1886), ... 25 cents.

No. 2. *Cerastium arvense*, L., and its North American Varieties. By Arthur Hollick and N. L. Britton (1887). (Out of print.)

No. 3. Plant Notes from Temiscouata County, Canada. By J. I. Northrop (1887). (Out of print.)

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... 25 cents.

No. 5. New or Noteworthy North American Phanerogams. By N. L. Britton (1888), ... 25 cents.

No. 6. An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1886–1887. By N. L. Britton. (Twenty-three parts published; not yet completed.)

No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . . . 25 cents.

No. 8. A Recent Discovery of Hybrid Oaks on Staten Island. By Arthur Hollick (1888), ... 25 cents.

No. 9. A List of Plants Collected by Dr. E. A. Mearns at Fort Verde and in the Mogollon and San Francisco Mountains, Arizona, 1884–1888. By N. L. Britton.

The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), ... 25 cents.

No. 10. Contributions to American Bryology—An Enumeration of the Mosses Collected by Mr. John B. Leiberg in Kootenai County, Idaho. By Elizabeth G. Britton. (Out of print.)

No. 11. Preliminary Notes on the North American Species of the Genus *Tissa*, Adans. By N. L. Britton (1889), ... 25 cents.

No. 12. The Genus *Eleocharis* in North America. By N. L. Britton (1889), 25 cents.

No. 13. New or Noteworthy North American Phanerogams, II. By N. L. Britton (1889), ... 25 cents.

No. 14. A List of State and Local Floras of the United States and British America. By N. L. Britton (1890), ... $1.

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VOL. XX. JULY, 1893. No. 7.

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OF THE

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A MONTHLY JOURNAL OF BOTANY.

EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., July 15, 1893. No. 7.

New or Noteworthy North American Phanerogams—VII.

By N. L. Britton.

(Plate CLVIII.)

Jacksonia, Raf. Med. Rep. (II.) v. 352 (1808). Professor Greene has argued in Pittonia, ii. 174 and 274 that this name should replace *Polanisia*, Raf. Journ. Phys. lxxxix. 98 (1819), but I cannot see that his position is tenable. *Jacksonia* is published at the place above cited as follows:

Jacksonia (trifoliata)=*Cleome dodecandra*, L. Now *Cleome dodecandra*, L. Sp. Pl. 672 is a well-known Indian species. Rafinesque evidently followed Michaux in supposing that it was North American, and *Cleome dodecandra*, Michx. Fl. Bor. Amer. ii. 32 (1803) is indubitably the same as *Polanisia graveolens*, Raf. Amer. Journ. Sci. i. 379 (1819), and not at all the plant of Linnæus. In matters of nomenclature we must be exact, and so it seems to me that *Jacksonia*, Raf., can only apply to the Asiatic, Linnæan, *Cleome dodecandra.* I do not find any allusion to *Jacksonia* in subsequent writings of Rafinesque, and presume that he discovered his error.

Alsine, L. Sp. Pl. 272 (1753). I note that this generic name must, on the recognition of priority of place, and the beginning of nomenclature in 1753, clearly displace *Stellaria*, L. Sp. Pl. 421 (1753).

As given in the Species Plantarum, the Linnæan *Alsine* is composed of *A. media* (*Stellaria media*, Smith) and *A. segetalis*, now referred to *Tissa.*

Rubus setosus, Bigel. Fl. Bost. Ed. 2, 198 (1824). *R. hispidus*, var. *setosus*, T. & G. Fl. N. A. i. 456 (1840). *R. hispidus*, var. *suberectus*, Peck, Ann. Rep. State Bot. N. Y. for 1890, 31 (1891).

I have recently had my attention directed to this plant by the examination of some of Prof. Charles H. Peck's material from Northern New York. He, in collecting it, saw at once that it was different from any of the ordinary *Rubi*, and being unaware of Dr. Bigelow's previous description of it as a species, proposed it as a variety of *R. hispidus* as cited above, a position which had been earlier maintained by Torrey and Gray. The plant is strikingly different in appearance and habit from *R. hispidus*, being much stouter, larger leaved, suberect or ascending, the older wood most densely clothed with slender, stiff, slightly reflexed bristles, and I have no evidence that it is evergreen. Its range, as I now know it, is from Quebec to Southern New York and Pennsylvania, as the following citations of localities will indicate: Quebec (according to Bigelow); Thetford Center, Vt. (Jesup); Morehouseville, Caroga, Lake Pleasant and Brown Tract, Adirondack mountains, N. Y. (Peck); near Riverdale, New York City (Bicknell); Sudbury, Mass. (Bigelow); Cambridge, Mass. (Nuttall); Pocono Plateau, Penna. (Britton). The flowers as indicated by Dr. Bigelow's and Mr. Bicknell's specimens are small. The fruit is reddish-black and about 1 cm. high. The leaflets are mostly acute or short-acuminate, generally 5 on the leaves of the sterile shoots and 3 on the flowering branches, short-petiolulate or sessile.

Rubus villosus, Ait. var. *humifusus*, T. & G. Fl. N. A. i. 455 (1840). *R. Canadensis*, var. *invisus*, Bailey, Am. Gard. xii. 83 (1891).

Some two years since, when Prof. L. H. Bailey was engaged in studying the *Rubi* which have been brought into cultivation for their fruits, he asked my opinion of the plant here alluded to, based on the specimens which had served as the type of the description, and other material which he at that time submitted. I examined the specimens and reached the conclusion, in which he subsequently concurred after seeing them, that it was all referable to *R. Canadensis*, L. I had not then seen the plant growing. Since then I have observed it growing in several places, and numerous field observations together with the accumulation of many herbarium specimens have convinced me that it is distinct from either *R. villosus* or *R. Canadensis*, as indicated by Prof. Bailey from Prof. Dudley's observations (Am. Gard. loc. cit). The plant is exceedingly abundant on dry wooded hills in Southwestern Virginia, where it was pointed out to me by Miss Vail and Mr. Small, who had noted its characters, and where *R. Canadensis* was not observed at all. It is also very plentiful on the Highlands of Navesink, N. J., in the woods; occurs in Pennsylvania and Central New York, and some of the type material was gathered by Dr. Torrey at West Point, N. Y.

Its range is doubtless much wider, however, than above indicated. It is a procumbent or ascending species, pubescent or nearly glabrous, the stem slender, sparingly prickly, the upper leaves almost invariably unifoliolate, and the racemes but 1-few-flowered. The leaflets are broadly ovate or oval, acute or more commonly obtuse, thin, the terminal ones usually cordate, or all of them rounded or obtuse at the base; the fruit is small in all the specimens seen by me. The plant appears to be always a dry woods species.

The specific name *humifusus* has already twice been used in the genus. I therefore propose that this plant be known as R. INVISUS (Bailey). Two possible older names by Tratteninck are doubtfully cited by Torrey and Gray as synonyms of their var. *humifusus*, but I cannot satisfy myself that either of them applies to the plant.

R. Canadensis and its several varieties are, in so far as I have observed them, always strictly trailing, glabrous or nearly so, occur in open, sunny, sandy or rocky soil, have larger acute or acutish leaflets, the uppermost sometimes unifoliolate, but commonly 3-foliolate, the racemes several-flowered, borne at the ends of erect or ascending branches, the fruit large, sweet and succulent, and with that of *R. cuneifolius* our best blackberries.

Valeriana pauciflora, Michx. Mr. R. H. Ingraham, of Niles, Ohio, after reading my note on this species (BULLETIN, xix. 223), obligingly sent me perfectly ripe fruits from a specimen collected by him near Indianapolis, Ind., which have the pappus elongated and plumose as in the other species of the genus, thus showing that my surmise that they do not elongate was erroneous. These fruits are narrower and much more lanceolate in outline than those of Professor Porter's specimen from Millersville, Pa., and many of them are slender-pedicelled.

GNAPHALIUM HELLERI, n. sp. *G. polycephalum*, var. β., T. and G. Fl. N. A. ii.

Similar to *G. obtusifolium*, L. and *G. decurrens*, Ives, corymbosely or somewhat paniculately branched above, 1½°–2° high, the stem and branches densely glandular-pubescent, not tomentose. Leaves oblong-lanceolate, sessile, acuminate at both ends, green and hispidulous above, white-tomentose beneath, the larger about 5 cm. long and 1 cm. wide, the uppermost much smaller and narrower; heads very numerous, corymbose or corymbose-paniculate, sessile or nearly so in the clusters, about 2½″ broad; involucre oblong or becoming campanulate, 6 mm. high, its bracts bright white, tomentose, the outer oblong, the inner linear-oblong, all obtuse; pappus bristles distinct to the base, separately deciduous; achenes glabrous.

In fields, Southeastern Virginia (Heller) to Georgia (Boykin).

The Genus Coreopsis, L. The close affinity of *Coreopsis* to *Bidens* has repeatedly been commented upon by modern authors, and it has been more than once maintained that the two should be regarded as congeneric. The principal diagnostic character which has been taken as separating them is the downwardly barbed pappus-awns of *Bidens*, the species with awned pappus which have been admitted into *Coreopsis*, having the awns upwardly barbed. This character has been found to completely fail in the case of *Bidens frondosa*, L., which, as it occurs along the Lower Delaware River in Pennsylvania, New Jersey and Delaware, has the awns either upwardly or downwardly barbed, and I have observed downwardly barbed awns in *Coreopsis discoidea*.

It is also stated by Dr. Gray that some of the species included by him in the Synoptical Flora in *Coreopsis* hybridize with *Bidens frondosa*.

For all this, it is my opinion that the genus *Coreopsis* should be maintained for the original types *C. verticillata*, *C. tripteris*, *C. auriculata*, *C. lanceolata* and their allies, which have a pappus of two short usually unbarbed teeth, a coroniform border or 0, and that those which have a pappus of awns upwardly or downwardly barbed should be referred to *Bidens*. The last six species of

Coreopsis in Dr. Gray's arrangement in the Synoptical Flora would thus go to *Bidens*, with species of which they have everything else in common. Their names would then be as follows:

Bidens coronata (L.) Fisch. fide Steudel. *Coreopsis coronata*, L. Sp. Pl. Ed. 2, 1281 (1763). *Coreopsis aurea*, Ait. Hort. Kew. iii. 252 (1789).

Bidens trichosperma (Michx.). *Coreopsis trichosperma*, Michx. Fl. Bor. Amer. ii. 139 (1803).

Var. tenuiloba (A. Gray). *C. trichosperma*, var. *tenuiloba*, A. Gray, Syn. Fl. i. Part 2, 295 (1884).

It appears to me as though further observation would demonstrate specific characters for this plant.

Bidens aristosa (Michx.). *Coreopsis aristosa*, Michx. Fl. Bor. Amer. ii. 140 (1803). *Coreopsis aristata*, Willd. Sp. Pl. iii. 2253 (1804).

Bidens involucrata (Nutt.). *Coreopsis involucrata*, Nutt. Journ. Phil. Acad. vii. 74 (1834).

Bidens bidentoides (Nutt.). *Diodonta bidentoides*, Nutt. Trans. Amer. Phil. Soc. (II.) vii. 361 (1841). *Coreopsis bidentoides*, T. and G. Fl. N. A. ii. 339 (1842).

Bidens discoidea (T. and G.). *Coreopsis discoidea*, T. and G. Fl. N. A. ii. 339 (1842).

Pseva, Raf. In his review of the botanical writings of Pursh, Elliott, Nuttall and others, published in the Journal de Physique, lxxxix. 256–262 (1819), Rafinesque states that *Chimaphila*, Pursh, (1814) is antedated by *Pseva*, Raf. Med. Rep. 1809. This is alluded to by Pfeiffer in the "Nomenclator," and the name has been taken up and *Chimaphila* displaced by Dr. Kuntze (Rev. Gen. Pl., 390), although neither of these authors appear to have seen Rafinesque's papers in the Medical Repository. There were several of these, published from 1805 to 1810. I wish to record here that I have recently gone over these papers line by line and can find no allusion to *Pseva* in any of them, nor have I met with the name in any of Rafinesque's writings except at the place where he claims it as noted above. It would thus appear to date from 1819 only, and not to interfere with *Chimaphila*. Rafinesque evidently derived it from the aboriginal name Pipsissewa, as in the case of *Hicoria*.

Pyrola oxypetala, C. F. Austin, in A. Gray, Man. Ed. 5, 302 (1867). [Plate CLVIII.]

The specimens on which this species is based were collected on hills at Deposit, Delaware county, N. Y., by Mr. Austin in 1860, and so far as I am informed, nothing like them has ever been found anywhere else. From Mr. Austin's original label and manuscript description preserved with a type specimen in the Herbarium of Columbia College, it would appear that he obtained very little of it, as he says it was "very rare." The plant is distinguished from all its congeners by its acuminate petals and spreading or ascending flowers. Dr. Torrey has annotated the herbarium sheet "abnormal form of *P. chlorantha*?" and Dr. Gray in his Synoptical Flora remarks "anomalous, perhaps monstrous." Whatever its relation to other species may be, the characters of the original specimen are distinct enough, and in order to direct attention anew to this interesting form I have thought it worth while to present an illustration in the hope that some one may encounter it again.

Anagallis cœrulea, Schreb. This is maintained as a species distinct from the common *A. arvensis*, L, by Koch, the authors of the last edition of the London Catalogue of British Plants and other European botanists. Its character is not alone its blue corolla, but that the corolla-segments are glabrous, those of *A. arvensis* being glandular-ciliate. Babington, who refers it to a variety of *A. arvensis* as does Ledebour, suggests that it is probably distinct. It would be well if those who have the opportunity would carefully examine these plants in the field and record their observations. Both the red and blue-flowered plants apparently occur in North America.

Paronychia pusilla, Greene, Pittonia, i. 302, Fl. Fran. 131, from "an isolated outcropping of rock in the mouth of a cañon opening to the plains at the eastern base of Mt. Diablo, near Bethany, Cal.," is *Herniaria cinerea*, D. C., a plant of Southern Europe.

Notes From the Minnesota State Herbaria.

I. SOME EXTENSIONS OF PLANT RANGES.

By Edmund P. Sheldon.

(Plate CLIX.)

Potamogeton Vaseyi, Robbins, in A. Gray, Man. Ed. 5, 485 (1867).

Not previously reported from Minnesota. Specimens of the fruiting form with floating leaves were found in Chisago lake, Chisago county, Minn. (B. C. Taylor, July, 1892).

Potamogeton Illinoensis, Morong, Bot. Gaz. v. 50 (1880).

Hitherto Minnesota collections of this species have been made only on the southern border of the State. It has been found at Lake Minnewaska, Pope county, Minn. (B. C. Taylor, Aug., 1891), and at Green lake, Chisago county, Minn. (B. C. Taylor, Aug., 1892).

v Sagittaria cuneata, n. sp. Aquatic, rooting in the sand; leaves long-petioled, sagittate or rarely oblong-lanceolate; blade floating, small, 2–3 inches in length, with linear lobes; phyllodia submerged, of two forms, either linear-attenuate and reaching nearly to the surface of the water, or lanceolate and clustered at the base; scape slender, terete, 2–3 feet in length, bearing whorls of flowers at the surface of the water; pedicels divergent, extended, ternate, with often a fourth in the upper whorls; bracts connate, lanceolate-ovate, acute; filaments glandular-thickened, not pubescent, shorter than the ovate anthers; achenia cuneate, short, one-half line in length, with minute retrorse beak above, outer and inner margins with single, tumid crests. [Plate CLIX.]

Abundant in shallow water of East Battle Lake, Otter Tail county, Minn., from which locality the type specimen is described. Found also in Mollie Stark and Blanche Lakes of the same county (E. P. S., Aug., 1892).

Poa debilis, Torr. Fl. N. Y. ii. 459 (1843).

Not previously reported from Minnesota. Abundant in open, sandy soil near Mora, Kanabec county, Minn. (E. P. S., July, 1892).

Eriophorum Virginicum, Linn. Spec. i. 52 (1753).

Not previously reported from Minnesota. Swamps and peat-bogs near Little Lake, Chisago county, Minn. (B. C. Taylor, Aug., 1892).

Scirpus maritimus, Linn. Spec. i. 50 (1753).

Not previously reported from Minnesota. It was found growing in saline marshes and around edges of swamps near Willmar, Kandiyohi county, Minn. (W. D. Frost, July, 1892).

Carex Norvegica, Willd. Spec. iv. 227 (1804).

Not previously reported from Minnesota. Collected in marshy ground near Irving Chase Lake, Cass county, Minn. (Mac M. and Sheld., Aug., 1890). In specimens from this collection the terminal spike is distinctly long-contracted below with the staminate flowers. It is remarkable that this plant, which has hitherto been reported for North America as occurring only in Maine and northward, should be found in the heart of the Minnesota forest.

Carex stricta, Lam. var. *decora*, Bailey, Bot. Gaz. xiii. 85 (1888).

Not previously reported from Minnesota. Common in sandy soil near Brainerd, Crow Wing county, Minn., and near Nichols, Aitkin county, Minn. (E. P. S., June, 1892). This variety seems to prefer upland, sandy places. It is frequently seen on the pine-barrens near the two above localities.

Carex exilis, Dewey, Am. Journ. Sci. Ser. I. xiv. 35 (1828).

Not previously reported from Minnesota. Collected in a tamarack swamp near Twin Lake, Hennepin county, Minn. (E. P. S., Sept., 1890), and in low, swampy ground west of Brainerd, Crow Wing county, Minn. (E. P. S., June. 1892).

Carex flava, Linn. Spec. i. 975 (1753).

Not previously reported from Minnesota. Typical specimens of this species were found in abundance on the shores of many of the lakes of Otter Tail county, Minn. (E. P. S., Aug., 1892).

CAREX ALBURSINA, n. sp.

C. laxiflora, Lam. var. *latifolia*, Boott. Ill. 38 (1858). Not *C. latifolia*, Schkr. Car. i. 104 (1801), which is a later name for *C. plantaginea*, Lam. Ency. Meth. iii. 392 (1789).

Not previously reported from Minnesota. This plant prefers moist edges of deep woods. It is abundant near Wilton, Waseca county, Minn. (E. P. S., June, 1891), and in the neighborhood of Mahtomedi, on the shore of White Bear Lake, Washington county, Minn. (E. P. S., July, 1892).

The tall aspect of the plant, with its broad leaves mostly clustered at the base, together with the broad bracts and sessile staminate spikes, seem to mark this as a distinct species.

Erysimum syrticolum, n. sp.

Glaucous throughout, with close, appressed hairs; stems upright, rigid, branching from the base, 1–2½ feet high; leaves rigid, sparse, linear-lanceolate, sparingly denticulate, 1–2 inches in length, early deciduous; flowers small, 3–4 lines in length; stigma conspicuously two-lobed; pods narrow, short, 6–15 lines in length, mostly tumid at the base, erect or slightly spreading on short, diverging pedicels, which are 2½–3 lines in length.

The locality of the type is on the high, sandy banks of Lake Benton, Lincoln county, Minn., where I collected it in August, 1891. During August, 1892, I found it sparingly on the gravelly shores of Pelican Lake, Otter Tail county, Minn. This species resembles *E. inconspicuum* (S. Wats.) MacM., but the glaucous, strict aspect and short pods fully characterize it.

Nasturtium obtusum, Nutt. in T. and G. Fl. i. 74 (1838).

Not previously reported from Minnesota. Frequent in low, marshy ground near Fergus Falls, Otter Tail county, Minn. (E. P. S., Aug., 1892).

Cratægus punctata, Jacq. Hort. Vindob. i. 10 (1770).

Not previously reported from Minnesota, although occurring frequently in Illinois, some portions of Wisconsin, and Eastern Missouri. A number of scattered bushes were found growing on open hillsides near Center City, Chisago county, Minn. (B. C. Taylor, June, 1892).

Astralagus multiflorus (Pursh) A. Gray, Proc. Am. Acad. vi. 226 1866).

Not previously reported from Minnesota. This plant was found in abundance on the sandy shores of Lakes Belmont and Eagle, Otter Tail county, Minn. (E. P. S., Aug., 1892). It has a bushy, bunched habit of growth. The bunches are frequently 2–3 feet in diameter. This adds another to the list of eastward traveling, Rocky Mountain plants growing in Minnesota.

Elatine Americana (Pursh) Arn. Edin. Journ. Nat. and Geogr. Sci. i. 430 (1830).

Not previously reported from Minnesota. This plant was found in abundance, growing in 2–6 inches of water at Linn Lake, Chisago county, Minn. (B. C. Taylor, Aug., 1892).

Bartonia Virginica (Linn.) B. S. P. Prel. Cat. N. Y. (1888).

Not previously reported from Minnesota. Found growing among moss in a peat-bog near Zumbrota, Goodhue county, Minn. (C. A. Ballard, Aug., 1892).

Collomia linearis, Nutt. Gen. i. 126 (1818).

Abundant on the shores of Mille Lacs Lake, Aitkin and Mille Lacs counties, Minn. (E. P. S., Aug., 1892). Plants collected by Dr. J. H. Sandberg, near Red Wing, Goodhue county, Minn. (Aug., 1885) and referred by him to this species are a large-leaved, bushy form. These two Eastern Minnesota collections represent, so far as is known, the only Minnesota localities of this western and northern species.

Solidago ulmifolia, Muhl. in Willd. Sp. Pl. iii. 2060 (1804).

Heretofore the only Minnesota collections of this plant have been made along the southeastern border of the State. It is abundant by roadsides and borders of woods near Lakes Lida and Pelican, Otter Tail county, Minn. (E. P. S., Aug., 1892).

Aster lateriflorus (Linn.) Britt. var. THYRSOIDEUS (A. Gray). *A. diffusus*, Ait., var. *thyrsoideus*, A. Gray, Syn. Fl. i. II. 187 (1888).

Not previously reported from Minnesota. This plant prefers sandy edges of woods. It is abundant near Lakes Belmont and Eagle, in the Leaf Hill district of Otter Tail county, Minn. (E. P. S., Aug., 1892).

ASTER INCANOPILOSUS (Lindl.).

A. ramulosus, Lindl. var. *incanopilosus*, Lindl. in DC. Prodr. v. 243 (1836).

A. multiflorus, Ait. var. *commutatus*, T. and G. Fl. ii. 124 (1841).

A. commutatus, A. Gray, Syn. Fl. i. ii. 185 (1888).

Not previously reported from Minnesota. This large-capitate species of the section Squarrosa is common on the dry prairie hills of Otter Tail county, Minn. (E. P. S., Aug., 1892).

Xanthium Canadense, Mill. var. *echinatum* (Murr.) A. Gray, Syn. Fl. i. II. 252 (1888).

This plant is common on the sandy shores of the lakes of Minnesota. Typical specimens of *X. Canadense*, Mill., prefer roadsides, fields and other open places.

Artemisia serrata, Nutt. Gen. ii. 142 (1818).

Reported as occurring from Illinois to Dakota, but probably never before collected in Minnesota. It was found in low swampy ground near Taylor's Falls, Chisago county, Minn. (B. C. Taylor, Aug., 1892).

Echinops sphærocephalus, Linn. Spec. i. 814 (1753).

This European composite has been introduced in the neighborhood of St. Anthony Park, Ramsey county, Minn. (Dr. Otto Lugger, Sept., 1891, and Oct., 1892). It is becoming thoroughly established. To my knowledge this is the first recorded occurrence of the plant in North America.

The Systematic Position of Hartwrightia Floridana.

By John M. Holzinger.

(Plate CLX.)

Dr. Gray established this monotypical genus of the order Compositæ on plants communicated by Dr. S. Hart Wright, who collected them in sphagnous swamps in Volusia county, Florida, in November, 1886. Since that time the plant seems not to have been collected again, except by Mr. Otto Vesterlund, who in November, 1889, found it near Pittman, Lake county, just west of the locality at which Dr. Wright discovered it. Is it possible that this is the full range of this plant? It seems that after the lapse of six years it ought to have turned up at more stations. It is more likely that the plant has been found, but could not be identified, and that this is the real reason for the meagre data concerning its distribution.

The genus *Hartwrightia* is first described in Proc. Am. Acad. xxiii. 264 (May 29, 1888). It is there referred to the Piquerieæ, with *Gymnocoronis* and *Adenostemma* as the nearest related genera, being supposed to be the only member of this subtribe within our limits. But the plant has evidently appendiculate anthers, and so should stand in the next subtribe, the Agerateæ. The nearest allied genus is *Allomia*, with which it has in common two characters, namely, absence of pappus, and the number of involucral bracts small. The latter in both genera are in two series, provided we count as a second series the 2 or 3 quite short outer bracts at the base of the anthodia of *Hartwrightia.* The genus therefore should be inserted after *Allomia*, in Durand's Index, under number 2441 b. This disposition is concurred in by the late Dr. Sereno Watson, whose kindly counsel in this and other matters is gratefully acknowledged.

Explanation of Plate CLX.

Hartwrightia Floridana, A. Gray.

a. An anthodium.
b. A floret.
c. A corolla, laid open, viewed from within.
d. An anther, showing the appendage at the apex.
e. An achenium.
f. The style and stigmas, viewed from two directions.
g. Cross-section of an achenium.

The Winter Buds of Utricularia.

By John M. Holzinger.

(Plate CLXI.)

In the summer of 1891 Dr. J. H. Sandberg, collecting in Northern Minnesota, sent to the United States Department of Agriculture a *Utricularia* (No. 516) which seems to be *Utricularia intermedia*, Hayne, though the details of leaves do not agree with Reichenbach's figures of this species. The specimens all have the good hibernacula or winter buds, to which reference is made in Gray's Synoptical Flora, Vol. ii., Part I, p. 315, as "hybernacular tuber-like buds." In these specimens they are about 6 mm. in diameter, and of the shape of a small bird's egg. They consist of numerous broadly palmate scales (Fig. c), crowded along the short axis, and standing out at right angles from it. These scales are beset along the margin with tufts of bristles, which, falling on the outside of the bud, give it the appearance of a small hairy cocoon. Its structure thus hardly warrants the use of the term "tuber-like."

The only specimen in the National Herbarium, among the all species of this genus that has a single winter bud represented, is one of *U. intermedia* collected by Engelmann in Germany in 1829; showing how little attention collectors have paid to this interesting organ on the submerged stems of *Utricularia*. Young leaves —for this is what these bristle-margined bodies from the buds seem to be—from Engelmann's specimen agree exactly with those from the Minnesota plants. At first orbicular, passing nearly around the axis, and having only a few primary incisions, they soon begin to branch out dichotomously, the bunches of bristles marking the apices of the leaf-divisions. This is shown in Engelmann's specimen, in which the bud begins to develop ordinary leaves at one end. The tufts of bristles thus at last become scattered, and persist as sharp teeth along the edges of the narrow leaf-divisions.

Reichenbach, in Icones Fl. Germ., figures two hibernacula of *Utricularia vulgaris*, representing them as of about twice the diameter as those of *U. intermedia*. Under *U. major* he states that he collected the hibernacula of this species abundantly near Leipzig, but found them never glutinous as in *U. vulgaris*. No figure of these buds is given. But for *U. minor* there is figured a leaf with a bud ("gemma"), which may be partly developed hibernaculum. The bud opens circinately, as do the growing ends of the ordinary leaf-bearing branches in the Minnesota plants (see Fig. a). And in case of the hibernacula this mode of unfolding appears improbable till established by observation. Reichenbach describes and figures two more species, *U. intermedia* and *U. Bremii*, but in neither case gives a reference or a figure of hibernacula.

Some discrepancies should be mentioned between the leaves and bladder-appendages of *U. intermedia*, as figured in Reichenbach, and as actually appearing in the specimens. In the figure the leaf divisions are represented as tapering uniformly like spines, and show no mid-vein; in the Minnesota specimens the leaf divisions are more ribbon-like, narrowing to a point only near the apex, and there is a distinct vein running to the apex of each division (Fig. b). The bladder in Reichenbach's figure has strong few-toothed appendages about one-third the length of the bladder; in the plant under consideration these appendages are as long or longer than the bladder, and are very slender branching filaments (Figs. e, f), somewhat like those figured in Reichenbach for *U. minor*, but with branches more slender and more numerous. The figure and the specimens agree in that the base of the flowering stem sends out two kinds of simple or nearly simple branches, one bearing only leaves, the other, more slender, bearing the bladders. In the fresh specimens these latter branches are seen to be furnished with leaves also, but these are smaller and more distinct than on the other branches. And the bladders, in fact, develop on these more scattered leaves, some of the leaf divisions always remaining distinct. This also is not well shown in Reichenbach's figure.

The hibernacular buds, finally, in this species may occur either on the leafy branches or on those with bladders. There is generally one, rarely more than two, on a plant, so far as appears from the specimens in hand. And they are always on a naked stalk or branch one to two inches long.

In the close observation of the presence, structure and development of the hibernacula in the different North American species of *Utricularia*, there is open an inviting field to some enterprising field botanists favorably located for such a task.

Explanation of Plate CXLI.

Utricularia intermedia.

a. A plant, reduced ½.
b. Leaf, enlarged.
c. Scale from bud, enlarged.
d, e. Bladder-bearing leaves, enlarged.

Notes on Nasturtium Armoracia.

By Charles A. Davis.

Three years ago the attention of the writer was incidentally attracted to this plant, and a series of observations was made on the occurrence on it of pinnatifid leaves, the results of which were published in the Bulletin.

Since that time the plant has been the source of much interest, from various structural peculiarities, of which no previous study has apparently been published. The description of the species, as given in the revised edition of Gray's Manual, is as follows: "Root-leaves very large, oblong, crenate, rarely pinnatifid, those of the stem lanceolate; fruiting pedicels ascending; pods globular (seldom formed); style very short. Roots large and long."

It has been pointed out already that the pinnatifid leaves are not "rarely" but normally present in the spring and fall. In addition, the quoted description should be amended by mention of the fact that the lower stem leaves are invariably pinnately dissected, and gradually pass through pinnatifid and notched forms until near the top they are simply lanceolate with crenate and toothed margins. Of hundreds of flowering stems examined, all had this peculiar arrangement of stem leaves, and extended observation has tended to confirm the opinion that the plant was originally semi-aquatic, which, at the time of flowering, was accustomed to stand knee-deep, as it were, in water. As a further proof of the value of structural peculiarities as indices of the former habits of plants, it may be well to note that very vigorous flowering plants of the species under consideration have been observed growing in ditches and on the margins of ponds, which, though full in the spring and fall, are dry or nearly so in the summer. These plants, at the time the notes were made, stood in water which was of such depth that the dissected leaves were nearly all covered.

By far the most interesting characters of this plant, however, are its provisions for propagation and the preservation of the species. As noted in the description quoted from the Manual, the pods are seldom formed. When formed they are without seeds and soon disappear, apparently falling off, leaving the pedicels fast to the axis of inflorescence. The cause of this failure to mature seed does not appear. The flowers are freely visited by insects, pollen is present in the anthers and seems abundant, and the ovary and ovules are apparently entirely normal. A possible cause of the lack of seeds suggested itself when the stigma was studied. This organ is covered with numerous comparatively long hairs, which may prevent the pollen from reaching the stigmatic surface, or it may be that the pollen, in order to fertilize the ovules, has to fall directly on the tips of these hairs. In either case it would seem highly probable that now and then seeds would mature, but a careful examination of a large amount of material failed to show such mature seeds. It is also possible that the peculiar structure of the stigma makes it impossible for the common insects which visit the plant to produce pollination, and that the peculiar insect developed along with the plant was left behind when it was brought from Europe. To one familiar with the peculiar readiness with which the plant propagates from the root, or even the smallest fraction of it, the absence of seeds capable of germination is not a great surprise, for the plant is well protected against extermination in this way.

The root, so called, has many of the characteristics of a rhizoma and develops buds and leaves from any part that is exposed to the light, or whenever the plant needs an increase of leaf surface. If all parts of the plant except the tips of the roots are destroyed each one of these tips may become one or more plants. If the root be placed on top of the ground it soon becomes green on the upper side at least, and clusters of leaves and rootlets appear. Oftentimes horizontal branches at some distance below the surface will send up vertical branches having small scales at regular intervals in place of leaves, thus forming a vertical rootstock. In one of a series of experiments undertaken to test the possibilities of the plant in this direction, thirteen pieces of the smaller parts of a root were taken, varying from five to nine mm. in diameter and cut into irregular lengths, varying from six mm. to three cm. These were placed in a tightly covered fruit jar, containing a little moisture and left exposed to the light for two weeks or a little longer. At the end of that time twelve of the pieces had green sprouts from one mm. to seven cm. long, measuring the longest leaf, besides numerous rootlets, growing from the points where the buds started out. One piece twenty-five mm. long had eleven well defined buds and sprouts on it, but no rootlets. To one piece a small fibrous branch was attached, and it also bore a vigorous sprout. At the present writing, more than two months after the fragments of root were placed in the jar, the plants which sprung from them are still alive, although the parent roots have rotted. Each of the plantlets has a short thick base, almost like a bulb, which is green in color and shows the scars of leaves which have fallen. In structure and position this part of the plantlet is identical with the tap-root of the plant, as it grows under normal conditions. The readiness of the root to send out buds and grow, is not of much use to the plant in bringing about a rapid and wide distribution of the species, in the undisturbed condition, for the roots do not spread widely, growing as a rule vertically downward, so that a plant and its descendants would be years in spreading a few feet in a lateral direction.

Having no seeds the plant would be handicapped unless some other way of propagation than root-division were developed. The emergency has been met in a manner that is as interesting as rare. Soon after the plant has ceased flowering, and the form of ripening seeds is gone through with, supernumerary buds appear in the axils of the leaves on the upper part of the stem and of those subtending the branches of the inflorescence. These buds grow into very short, acaulescent in fact, branches as the season progresses, and give the old flowering stems the appearance of being diseased. A careful examination of these short branches shows them to be made up of clusters of little leaves, closely resembling seedlings. Each of the older leaves in the cluster has the base of its petiole thickened, and taken together the reserve food supply of one of the branches is considerable. When broken from the parent stem and placed in water these branchlets at once send out roots and are ready to take their chances in life with much greater likelihood of success than the ordinary seedling. A single flowering stem will often develop more than a hundred of these plantlets, all of which are capable of taking root if opportunity offers. Just when or how the plantlets separate from the stem has not been determined, but most likely they fall with the old flowering stem to the ground or into the water, and being set free by the breaking up of the stem, are driven ashore by the wind, where they readily take root. The fact that this provision of the plant for maintaining itself has been developed, leads to some interesting speculations as to the origin of the habit, whether not maturing seeds was the cause or the effect of the other habit, but like many other questions it would seem as if this one would have to go unanswered until our knowledge increases.

Notes on the Flora of Southern New Jersey.

The following notes, unless otherwise stated, refer to the plants of Atlantic county, N. J., and as these plants have been collected since 1889, for the most part, the notes are to be considered as supplementary to the notes in Prof. N. L. Britton's Catalogue of Plants Found in New Jersey.

Delphinum Consolida, L. White flowers common at May's Landing.

Polygala polygama, Walt. Collected with F. E. Lloyd near Egg Harbor City. The only place I have found it in Atlantic county.

Silene inflata, Smith. May's Landing.

Silene noctiflora, L. May's Landing and Elwood.

Rhus typhina, L. Weymouth and May's Landing, and also along the road between these places.

Lespedeza angustifolia (Pursh) Ell. Atsion and Indian Mills, Burlington county, and abundant in Atlantic county.

Phaseolus polystachyus (L.) B. S. P. Avon-by-the-Sea, Monmouth county.

Galium verum, L. May's Landing, one place only.

Aster gracilis, Nutt. Pancoast Mills.

Aster Novæ-Angliæ, L. Rare. Elwood and Pleasantville only.

Hypochæris radicata, L. Has become naturalized at Pleasantville. Also found at Avon-by-the-Sea, Monmouth county.

Trientalis Americana (Pers.) Pursh. May's Landing. Not common in Atlantic county.

Erythræa ramosissima, Pers. Brigantine Beach. Quite abundant. August, 1891.

Myosotis laxa, Lehm. Not common. One place May's Landing and one place Pleasantville.

Lycopus sessilifolius, A. Gray. Near Great Egg Harbor River, below May's Landing. A locality further south and on a different river from the other reported localities.

Pycnanthemum muticum (Michx.) Pers. Pleasantville.

Pycnanthemum Virginicum (L.) B. S. P. Elwood only.

Calamintha; an introduced species. Elwood. One place in a field. May 30, 1892.

Plantago Patagonica, Jacq., var. *aristata* (Michx.) A. Gray. Found everywhere and is increasing rapidly.

Lindera Benzoin (L.) Meisn. Pleasantville and Elwood. I have carefully looked for it in the early spring, and I am sure that it is not common in Atlantic county.

Quercus. Near May's Landing. Collected with J. C. Gifford. It is apparently *Q. Phellos*, L., × *Q. ilicifolia*, Wang.

Aplectrum spicatum (Walt.) B. S. P. Princeton, Mercer county.

Speiranthes simplex, A. Gray. Elwood.

Arethusa bulbosa, L. Near Princeton Junction, Mercer county.

Smilax laurifolia, L. May's Landing and Pleasantville.

Helonias bullata, L. Pleasantville. Not "frequent" in Atlantic county, so far as my experience goes.

Pontederia cordata, L., var. *angustifolia*, Pursh. In Great Egg Harbor River, above May's Landing.

Arisæma triphyllum (L.) Torr. Pleasantville, abundant in one locality.

Selaginella apus (L.) Spring. Common at Pleasantville and at May's Landing.

Botrychium ternatum (Thunb.), Sw., var. *obliquum* (Muhl.) Milde. and var. *dissectum* (Spreng.) Milde., were found growing together in one locality at Pleasantville. So far as my experience goes no *Botrychium* can be said to be "frequent" in Atlantic county.

Aspidium Noveboracense (L.) Sw. May's Landing.

Aspidium spinulosum, Sw., var. *intermedium* (Willd.) D. C. Eaton. In cedar-swamp, Pleasantville, abundant in one place and evergreen.

JOHN E. PETERS.

PLESANTVILLE, N. J.

Notes on some Fungi collected in Jamaica.

BY T. D. A. COCKERELL.

Although the ferns and mosses of this island have received a considerable share of attention, the fungi, so far as I can learn from available literature, have been almost entirely neglected. Mr. J. B. Ellis, of Newfield, has lately been most kind in identifying Jamaican fungi for me, and the results already attained show that there is plenty to be found that is new or interesting. Some new species await description—four have already been described in the *Journal of the Institute of Jamaica*, 1892–93, but the following notes on species already known (with one exception) may serve as a slight contribution to the flora:

1. *Æcidium Euphorbiæ*, Pers. East street, Kingston.
2. *Agaricus campestris*, L. Dr. Plaxton informs me that during September, 1891, mushrooms of the ordinary species were gathered in abundance in the grounds of the Lunatic Asylum, Kingston.
3. *Antennaria Robbinsii*, B. & M. Dr. Strachan gave me a twig infested with this.
4. *Arcyria incarnata* (Pers.) Balaclava, parish of St. Elizabeth.
5. *Aschersonia turbinata*, Berk. On leaves of Tangerine orange at Mandeville (1,950 ft. alt).
6. *Cyathus striatus* (Huds.) Mandeville.
7. *Didymium clavus*, A. & S. Balaclava.
8. *Hypoxylon Broomeianum*, B. & C. On a log, Balaclava.
9. *Hypoxylon Howeianum*, Pk. On a fence, Mandeville.
10. *Lenzites striata*, Sw. On a railway tie, Balaclava. Also found in Kingston.
11. *Megalonectria pseudotrichia* (Schw.) Mandeville.
12. *Monilia candida*, Bon., form. On decaying *Zea Mays* (from Pedro) in Kingston.
13. *Pellicularia Koleroga*, Cooke. On leaves of coffee, near Mandeville.
14. *Perichæna depressa*, Lib. Kingston.
15. *Peziza Dochmia*, B. & C. Found at Cherry Garden by Mr. Marescaux. Mr. Ellis tells me it was originally found in Cuba.
16. *Phoma leguminum*, West. East street, Kingston.
17. *Polystictus versicolor*, Fr. Moneague. A variety of the same on a stump at Mandeville.
18. *Rhizomorpha subcorticale*, Pers. Balaclava.
19. *Schizophyllum commune*, Fr. Kingston, Moneague and Balaclava.
20. *Sphærotheca pannosa* (Wallr.) Lev. On rose, Kingston (Dr. Lockett). Identified by Mr. B. T. Galloway.

21. *Stilbum flavidum*, Cooke. On coffee leaves received from Mr. G. Massy, of Richmond Vale, Trinity Ville.
22. *Uredo Vialæ*, Lag. On grape vine, Kingston and environs, abundant.
23. *Uromyces Euphorbiæ*, C. & P. East street, Kingston, growing with the *Æcidium* (No. 1).
24. *Ustilago affinis*, Ell. & Ev. On *Stenotaphrum Americanum* Schr. (identified by Dr. Vasey) at Mandeville. This is a new species, of which Mr. Ellis writes: "Very near *U. virens*, Cke., but spores rather larger and lighter colored, and not granular roughened." (In litt., Nov. 10, 1892.)

INSTITUTE OF JAMAICA,
KINGSTON, JAMAICA, January 13, 1893.

Botanical Notes.

Fungi Columbiani.—Owing to our inability to supply any more sets of the NORTH AMERICAN FUNGI, we have concluded to issue a second edition of this collection, under the name of FUNGI COLUMBIANI, in order to distinguish it from N. A. F., 1st edition, series 2d.

The specimens in this 2d edition will not be in bound books, but will be distributed loose, and will be supplied at $6.00 per 100 or Century. We shall issue only 60 copies. This 2d edition will not interfere with the 1st edition (Cents. I.–XXIX.), which will be continued as material comes to hand. Species not in edition 1st will not be issued in edition 2d, unless there is enough for both, so as not to do injustice to the subscribers to edition 1st by obliging them to buy edition 2d also.

The numbers of any given species in the 2d edition will not necessarily be the same as those of these same species in 1st edition. We expect to have Century 1st ready by the end of this year. The species will have printed labels, as in edition 1st.

J. B. ELLIS,
NEWFIELD, N. J. B. M. EVERHART.

Funghi Parassiti delle Piante Coltivate.—G. Briosi and F. Cavara, Pavia, Italy. Fascicolo IX. (Nos. 201 to 226) of this collection of fungi contains specimens of *Cystopus candidus* and *C. Bliti*:

and several rusts including *Puccinia bullata* on *Conium*, a species that may be expected upon our celery at any time. Two root fungi are represented, namely: *Sclerotinia Libertiana*, Fl., and *Rhizoctonia violacea*, Tul. Only one species bears the name of the publishers—*Septoria Chrysanthemi*, Cavara, on *Chrys. Japonicum.* The specimens are accompanied by a bibliography, synonomy, engraving giving various details and copious notes. B. D. H.

Economic Fungi.—By A. B. Seymour and F. S. Earle. Fascicles vi.–viii. (Nos. 251–400) are devoted to parasites on weeds, and are "auxiliary to the experiment station exhibit of weeds at the Columbian Exposition at Chicago, with the coöperation of Byron D. Halsted," etc. The 150 species of fungi represent in their hosts 36 families of plants.

The order most largely represented is naturally the Compositæ, as it is the great weed family, but some others, as the Cruciferæ, Polygonaceæ and Gramineæ are not far behind. There are 101 species of hosts. Some species of fungi are represented upon two or more hosts, as *Cystopus candidus*, upon three crucifers; *Peronospora Halstedii*, upon four composites; *Coleosporium Ipomœæ*, upon three *Ipomœas*, and *Puccinia Polygoni-amphibii*, upon three smartweeds. Eleven new species are distributed (published elsewhere in the BULLETIN). One of these found upon two related hosts has been given a hyphen-word for the genera of the hosts, namely, *Cercospora Arcti-Ambrosiæ*, Hals.

One of the points of special interest is the considerable number of seedling hosts. Fungi are very likely most effective in checking weeds when the attack is early. The seed-leaves are often the first organ to be attacked, and some specimens illustrate this important point.

The collection is neatly mounted and substantially bound, and the editors should feel proud of their superior work. N. L. B.

International Botanical Congress. The following notice is issued by Prof. J. C. Arthur, chairman of a committee recently appointed by Prof. C. E. Bessey, Vice-President of the Section of Botany, A. A. A. S.

An International Botanical Congress will be held at Madison, Wis., U. S. A., beginning August 23, 1893, and continuing three or more days. All botanists are eligible to membership, and are earnestly requested to attend the sessions, so far as possible. A membership fee of two dollars will be required.

The purpose of the Congress is the presentation and discussion of botanical questions of general interest relating to the advancement of the science. It is expected that the International Standing Committee on Nomenclature, appointed last year at the Genoa Congress, will present its first report at this time. Papers embodying research will not be received, but such papers, whether by American or foreign botanists, may be presented before the Botanical Section or the Botanical Club of the American Association for the Advancement of Science, which holds its annual meeting preceding that of the Congress (August 17 to 24).

Reduced rates of travel by steamship or railway cannot be provided by the Congress, but special rates can be obtained for the World's Columbian Exposition at Chicago. Madison is reached by several lines of railway from Chicago, and is distant only about four hours.

It is hoped that societies will send delegates to the Congress. It is requested that all persons intending to be present notify the chairman of the committee of arrangements at as early a date as possible.

Another circular giving further information and also a program of the sessions will be issued in July.

Committee
J. C. Arthur, LaFayette, Ind.
L. H. Bailey, Ithaca, N. Y.
N. L. Britton, New York, N. Y.
D. H. Campbell, Menlo Park, Cal.
J. M. Coulter, Lake Forest, Ill.
F. V. Coville, Washington, D. C.
B. T. Galloway, Washington, D. C.
Conway MacMillan, Minneapolis, Minn.
B. L. Robinson, Cambridge, Mass.
L. M. Underwood, Greencastle, Ind.

Index to Recent Literature Relating to American Botany.

Albert Kellogg (Zoë, iv. 1), with portrait.

Alien Plants in California. W. L. Jepson (Erythea, i. 140).

Amorpha fruticosa—The Range of. John M. Holzinger (Erythea, i. 131).

Ampelopsis quinquefolia—Notes on a Variety of. E. B. Knerr. (Bot. Gaz. xviii. 70, 71).

Description of a new variety, var. *vitacea*, the form of the Virginia creeper which does not cling to supports.

Analytical Keys to the Genera and Species of the Fresh Water Algæ and the Desmidiæ of the United States. Alfred C. Stokes (8 vo. pp. 116, one plate; Portland, Conn., 1893).

Dr. Stokes is an adept in the compiling of artificial keys, as we have had occasion to note in examining his publications in the Journal of the Trenton Natural History Society. That such keys are important time-saving devices must be apparent to every one, and when constructed with the accuracy of Dr. Stokes they become important factors in the rapid determination of genera and species. The only danger in their use lies in the fact that they cannot, as a rule, cover quite all the variations which some species exhibit. The present work is based on the writings of the late Dr. Francis Wolle. N. L. B.

A New Fashion in Writing Plant Names. Edward L. Greene (Erythea, i. 138).

A discussion of the decapitalization of specific names and the omission of the comma between the name and the author cited.

Anthracnose of Fruit—A New. G. F. Atkinson (Cornell Exp. Station Bul. 49).

Professor Atkinson figures and describes a new twig disease under the name of *Glœosporium cingulatum.* The methods of separating the fungus and making pure cultures are fully detailed. In the same bulletin may be found interesting notes upon the *Cercospora* of celery blight. B. D. H.

Black Walnut—The. J. T. Rothrock (Forest Leaves, iv. 38). With illustrations of *Juglans nigra.*

Botanical Writings of Edward L. Greene—The. Katharine Brandegee (Zoë, iv. 63).

Bromelia Argentina. J. G. Baker (Hooker's Icon. Pl. xxiii. Pl. 2258). A new species from the Argentine Republic.

Bromelia fastuosa. W. Watson (Gard. and For. vii. 224, illustrated).

Californian Cryptogams—Two. Marshall A. Howe (Erythea, i. 112).

Fimbriaria nudata is described as new, and an illustration of a peculiar form of *Polypodium Californicum* is given.

Carduus edulis—Habitat of. Edward L. Greene (Erythea, i. 143).

Check-List of the Plants of Gray's Manual. Compiled by John A. Allen (Cambridge, 1893).

This little pamphlet is a list of the 3,781 species contained in the last edition of Gray's Manual with addition of 140 species, either new, introduced or recently reported to be within its limits.

Colorado Plants—Notes on Some. Alice Eastwood (Zoë, iv. 2).

Phacelia splendens and *Pentstemon Moffatii* are described as new.

Contributions to Western Botany. M. E. Jones (Zoë, iv. 22, with one plate).

Notes on some species of *Astragalus*, of which *A. anisus*, *A. Wetherilli*, *A. cicadæ*, *A. Preussii*, var. *latus* and var. *sulcatus*, *A. pictus*, var. *angustus*, and *A. patens* are described as new. Notes on *Neillia*, *Coloptera*, *Cymopterus*, *Zauschneria* and *Dodecatheon* are given. *Eremocrinum* is a new genus in the Liliaceæ, with one species, *E. albomarginatum*.

Corrections in Nomenclature—I., II. Edward L. Greene (Erythea. i. 114, 136).

The first article deals with the Australian genus *Piptomeris*, Turcz., to which the name of *Jacksonia* was inadmissibly applied. The second includes notes on the genus *Uropappus*, on *Malacothrix parviflora* and *Micrampeles Rusbyi*, the latter a correction of *M. macrocarpa*, Britton.

Enumeration of the Lichens found in New Bedford, Massachusetts, and its Vicinity from 1862 to 1892, by Henry Willey. (Printed for the author. New Bedford, Massachusetts. E. Anthony & Sons. 1892.)

This pamphlet of thirty-nine pages is taken up with a great deal of anticipation as a last word from America's veteran lichenologist, and the anticipation is more than realized on a careful perusal of the list. The author states in his preface that such lists are not usually of much importance, but he has produced a list that will certainly remain classic and of great stimulus to future investigators. A brief description of the region explored is found with brief notes upon the floral and geological characteristics especially bearing upon the question of lichen habitat. The author indulges in a few remarks of regret regarding the acceptance of the "Schwendener theory" by "American professors," charging them with a lack of acquaintanceship with the anti-Schwendener lichenological writings, but, as it is remarked, "the last words have not been said upon this question," so perhaps it would be best not to pursue a controversy now a quarter of a century old. The author's parting instructions no doubt contain their atom of truth which we deem better not to have been expressed in such a place.

Fifty-six genera and 369 species are enumerated; following, in the main, the classification of the Genera Lichenum; of this number. 39 species were new when discovered "by the author." A few further new species are noted:

Biatora Papillariæ and *B. Cladoniscum*, both parasitic upon *Cladonia Papillaria*; *B. terrena*, *B. rubido-fusca*, *Opegrapha cinerascens*, *Calicium pallidellum* and *Coniocybe gracilescens*.

It is to be hoped that the list before us will be an incentive to further work in this field of Cryptogamic botany. In closing this brief review we express our regrets that the author's failing eyesight shall deprive us of further results of his long continued and critical work. S. E. J.

Enumeration des Hepatiques Connues jusqu' ici aux Antilles Francaises. E. Bescherelle (Journ. de Bot. vii. pp. 174, 183).

One hundred and forty-eight species are recorded.

Flowers and Insects—X. Charles Robertson (Bot. Gaz. xviii. 47–54).

Notes on the insects observed visiting *Steironema lanceolatum*, *S. longifolium*, *Frasera Carolinensis*, *Ellisia Nyctelea*, *Comandra umbellata*, *Spiranthes gracilis*, *Orchis spectabilis* and *Habenaria leucophæa*.

Fungi of Blowing Rock, N. C. Geo. F. Atkinson and Hermann Schrenk (Journ. Elisha Mitchell, Sci. Soc. ix. 95–107).

Two hundred and fifty-four species are enumerated.

Fungus from the Coal Measures—A New. H. Herzer (Am. Geol. xi. 365, 366, Pl. ix.).

This is a poorly prepared description of a supposed fungus growth found under the bark of a *Sigillaria*, from the Zoar Limestone, Tuscarawas county, Ohio. A wretched plate accompanies the article, which we are told represents the new genus and species, *Incolaria securiformis.* Mention is also made of another species which is to be described in a forthcoming paper. We trust that both the plate and text of the latter will prove to be executed with reasonable care, as it is by reason of such as are now before us that doubt and discredit are thrown upon many valid and important discoveries. A. H.

Galinsoga parviflora—Zur Geschichte der Einwanderung von. Fr. Buchenau (Abhand. Nat. Ver. Bremen, xii. 551).

Generic Nomenclature. H. Baillon (Erythea, i. 116).

Grape—The Frost or River Bank. L. H. Bailey (Am. Gard. xiv. 321). With illustration of *Vitis riparia* and notes on the types of several other species.

Influence of Anæsthetics on Plant Transpiration. Albert Schneider (Bot. Gaz. xviii. 56–69; one plate).

Is Polyporus carnivorous? O. F. Cook (Bot. Gaz. xviii. 76–78).

Mr. Cook expresses hesitation in accepting Prof. Conway MacMillan's conclusion that *Polyporus* digests animal matter.

Kakteen der Grand Mesa in West Colorado—Die. C. A. Purpus (Monats. Kakteenk. iii. 49).

Kansas Trees—A Preliminary Report upon the Variety and Distribution of. S. C. Mason (Pamph. pp. 16; reprinted from the 8th Bien. Rep. Kansas State Board Agric. 259–274, 1891–92).

An account of the geographical and altitudinal distribution of Kansas trees, with notes on the species.

Leaf Variation—Its Extent and Significance. Mrs. W. A. Kellerman (Journ. Cinn. Soc. Nat. Hist. xvi. 49, with one plate).

Lichens of Ohio. E. E. Bogue (Journ. Cinn. Soc. Nat. Hist. xvi. 37).

One hundred and sixty-six species are listed.

Mosses of Mt. Desert Island. Theo. G. White (Bull. Gray Mem. Bot. Chap. Agaz. Ass. i. 2).

Mycology—Report by Dr. James E. Humphrey. (Mass. State Agric. Exp. Sta. 1892).

With five plates illustrating *Sclerotinia Libertiana*, *Erysiphe Cichoracearum*, *Cladosporium cucumerinum* and *Plowrightia morbosa.*

Myxomycetes of the Miami Valley—II. A. P. Morgan (Journ. Cinn. Soc. Nat. Hist., xvi. 13, illustrated).

Forty-three species are enumerated. The new species described are *Hemiarcyria plumosa*, *H. ablata*, *H. funalis* and *Oligonema fulvum.* One new genus with one species, *Calonema aureum*, is also described.

Nanomitrium, Lindb.—Sur le genre. H. Philibert (Revue Bryol. xx. 49, 1893).

A very interesting comparison of *N. tenerum* with our three species confirms the specific rank of all, and especially of *N. megalosporum* (Aust.), which Lindberg had referred to it as a synonym. In sending specimens to M. Philibert, I called his attention to the fact that the spore-measurements of *N. megalosporum* are double the size of those given by Limpricht for *N. tenerum*, but having poor specimens of the latter, I could not make the complete series of comparisons which he has made. The descriptions will be found very complete, and include *N. æquinoctiale*, Spruce. E. G. B.

New or Little Known Plants Collected on Mount Orizaba in the Summer of 1891. Henry E. Seaton (Proc. Amer. Acad. xxviii. 116, reprint).

The new species are *Drymaria filiformis*, *Astragalus Orizabæ*, *Desmodium subsessile*, *Phaseolus Esperanzæ*, *Eryngium Seatoni*, *Arracacia nudicaulis*, *Viguiera pedunculata*, *Encelia stricta*, *Calea multiradiata*, *Tagetes linifolia*, *Euphorbia ramosa*, *Muhlenbergia Seatoni* and *Festuca rubra*, var. *Schlechtendahlii.*

New Plants of the Pacific Coast—I. Thomas Howell (Erythea, i. 109).

Species of *Thermopsis*, *Lupinus*, *Trifolium* and *Astragalus* are described as new.

Note sur une Cyperacee entophile. G. de Lagerheim (Journ. de Bot. vii. 181). *Dichromena ciliata*, Vahl, is the species noted.

Notes on the Flora of Texas. L. H. Pammel (Proc. Iowa Acad. Sci. 1892, 62–76). Enumeration of 291 species, with localities.

Notes on the Pollination of Cucurbits. L. H. Pammel (Proc. Iowa Acad. Sci. 1892, 79).

Notes on West American Umbelliferæ—III. John M. Coulter and J. N. Rose (Bot. Gaz. xviii. 54–56).

An account of some of Capt. J. Donnell-Smith's Guatemala plants; *Arracacia Luxeana* is a new species and *Eniantiophylla* a new genus of one species, *E. Heydeana*

Notes on North American Coniferæ—II. J. G. Lemmon (Erythea, i. 134). Notes on *Pinus Engelmanni*, Carr. and its synonymy.

Novitates Occidentales—III. Edward L. Greene (Erythea, i. 125). *Isopyrum occidentale*, var. *coloratum*, *Ranunculus Californicus*, var. *crassifolius*, *Lupinus eminens*, *L. tricolor*, *L. propinquus*, *Helianthella castanea* and *Phacelia imbricata* are the new species described.

Œdema of the Tomato. G. F. Atkinson (Cornell Univ. Ag. Exp. Sta. Bull. 53).

This is a swelling of portions of the tomato plant, due to excess of water and is a favored by: 1. Insufficient light. 2. Excess of soil water. 3. Soil temperature too near that of the air. The long nights, short days and cloudy weather of winter induce the œdema, especially if the soil is kept wet and of nearly the same temperature as the air above. Artificial œdema was produced in cut stems when water was forced into them through a hydrant hose. This process, and the microscopic structure of the abnormal cushions of œdematic plants are well illustrated in eight full page plates. The lack of light, excess of moisture and deficient soil temperature develop a weakened condition in the plant that may predispose it to attacks from fungi. The unnatural enlargement of the cells is a manifest weakness, or in the words of the investigator, "plants can grow themselves to death."

B. D. H.

Ohio Erysipheæ—The. A. D. Selby (Bull. No. 3 (Tech. Series) Ohio Exp. Station).

Professor Selby monographs the powdery mildews of Ohio, treating of twenty-four species, one of which *Uncinula Columbiana*, upon *Scutellaria lateriflora* is new and is illustrated in a plate. One associates our anniversary year with the name. B. D. H.

Orthotrichum Sturmii and O. rupestre.—Notes on. P. Culmann (Rev. Bryol. xx. 58, 1893).

Two new varieties are described from European specimens. *O. Sturmii*, var. *reticulatum* is based on the teeth being reticulated, not papillose; and *rupestre* var. *lamelliferum* on the presence of a preperistome, composed of basal lamellæ as in *O. cupulatum.* These lamellæ are papillose and composed of two or three joints reaching .02–.038 mm. above the annulus. They were also noted in *O. Sturmii*, though smooth. E. G. B.

Passiflora Jenmani. Maxwell T. Masters (Hooker's Icon. Pl. xxiii. Pl. 2270).

A new species of British Guiana.

Phænological Notes for 1892. L. H. Pammel (Proc. Iowa Acad. Sci. 1892, 46–61).

Tabulation of a very large number of observations on the earliest appearance of leaves and flowers.

Plants Injurious to Stock—Some. Thomas A. Williams (South Dakota Agric. Coll. Exp. Sta. Bull. No. 33).

Illustrations are given of *Astragalus mollissimus, Oxytropis Lamberti, Crotalaria sagittalis*, etc.

Quebracho. E. L. Baker (Hardwood, iii. June 10, 1893).

Relation of Frost to certain Plants. L. H. Pammel (Proc. Iowa Acad. Sci. 1892, 77–79).

Ramona—A second Species of the Genus. Edward L. Greene (Erythea, i. 144).

Contributions from the Herbarium of Columbia College.

No. 1. A Preliminary List of North American Species of *Cyperus*, with Descriptions of New Forms. By N. L. Britton (1886), ... 25 cents.

No. 2. *Cerastium arvense*, L., and its North American Varieties. By Arthur Hollick and N. L. Britton (1887). (Out of print.)

No. 3. Plant Notes from Temiscouata County, Canada. By J. I. Northrop (1887). (Out of print.)

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... 25 cents.

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No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . . . 25 cents.

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No. 10. Contributions to American Bryology—An Enumeration of the Mosses Collected by Mr. John B. Leiberg in Kootenai County, Idaho. By Elizabeth G. Britton. (Out of print.)

No. 11. Preliminary Notes on the North American Species of the Genus *Tissa*, Adans. By N. L. Britton (1889), ... 25 cents.

No. 12. The Genus *Eleocharis* in North America. By N. L. Britton (1889), 25 cents.

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No. 14. A List of State and Local Floras of the United States and British America. By N. L. Britton (1890), ... $1.

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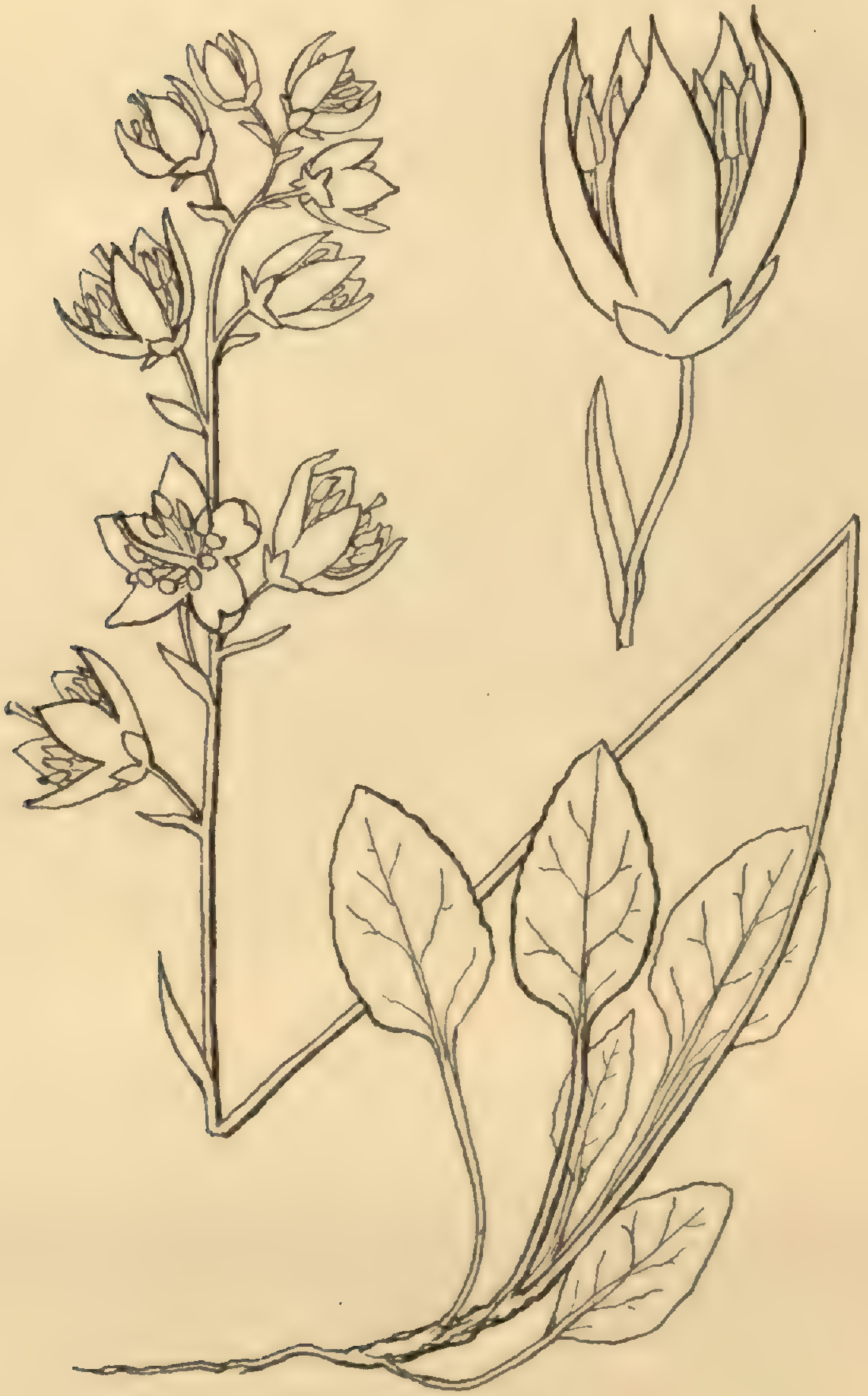

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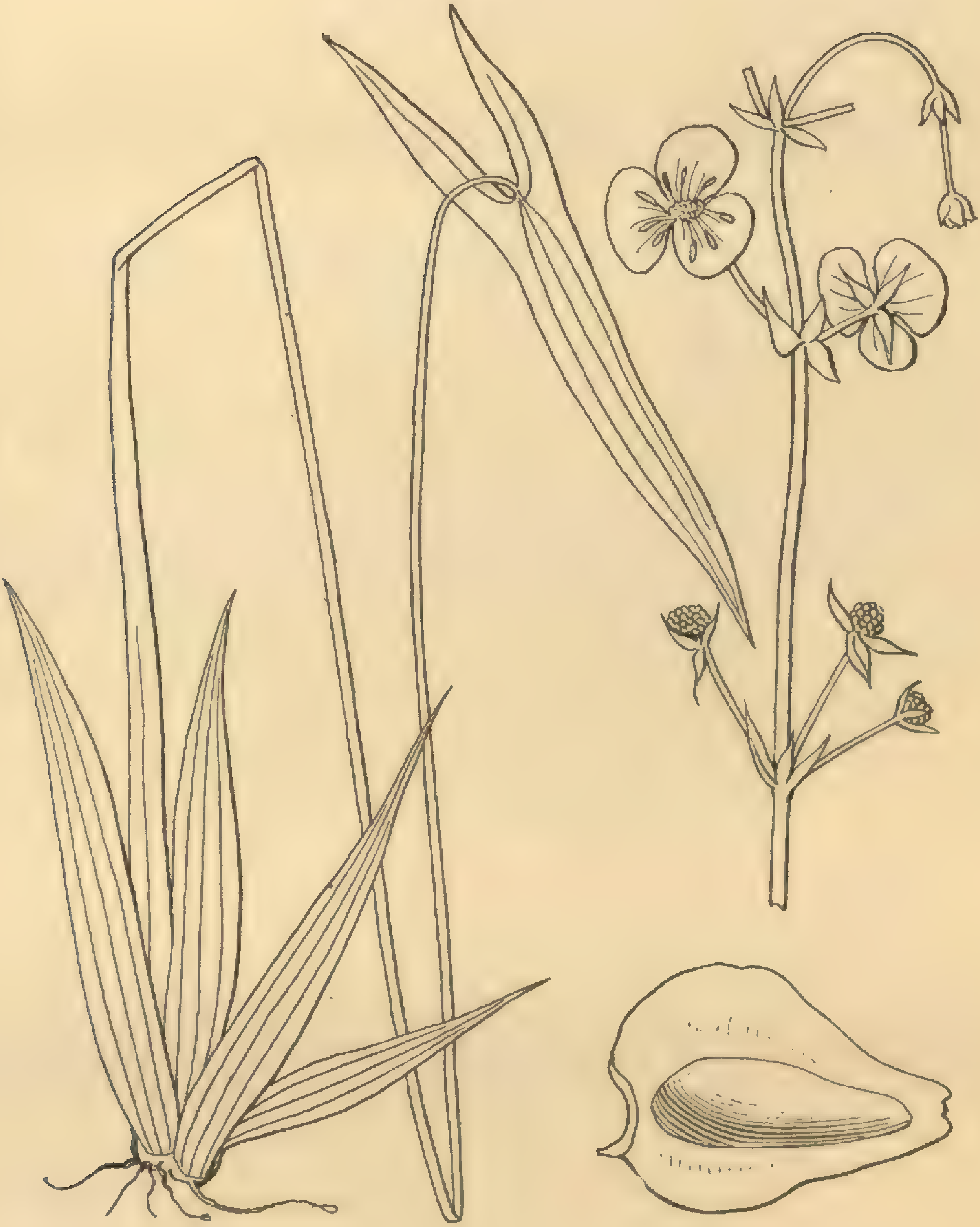

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BULLETIN

OF THE

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A MONTHLY JOURNAL OF BOTANY.

EDITED BY

NATHANIEL LORD BRITTON,

AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., August 10, 1893. No. 8.

Two new American Hepaticæ.

By Alexander W. Evans.

(Plates CLXII.–CLXIII.)

Lepidozia sphagnicola, n. sp. Dioicous, densely cæspitose, brownish-green varying to pale green; stems suberect, irregularly pinnate above, obtuse or very rarely terminating in a leafless flagellum; in transverse section orbicular, 6 cells in diameter, cortical cells about 12-seriate, slightly convex outward, about the same size as the inner cells, but with thicker walls; lateral branches short, leafy, usually obtuse; postical branches, when present, flagellate, hyaline, leafless, radiculose; radicles fasciculate, few in number in the upper part of the plant, simple or irregularly branched, sometimes ending in a sphæroidal expansion especially on the flagella; stem-leaves mostly distant, transversely inserted, quadrate, deeply 4-parted to within about 2 cells of the base, sinuses narrow, lobes subequal, lanceolate, strongly incurved, ending in a single cell and from 2 to 4 cells wide at base, usually entire, but sometimes bearing a small tooth (composed of from 1 to 3 cells) on the antical leaf-margin near the base; branch leaves similar to the stem-leaves, imbricated, more rarely bearing an antical tooth; stem-under leaves rectangular, subequally 4-parted to within 1 or 2 cells of the base, lobes subulate, 1 cell broad at the apex and usually 2 cells broad at the base; branch-under leaves similar to those of the stem, but usually smaller and only twice or thrice divided, with one of the lateral lobes longer and broader than the others; perianth terminal on a short postical branch given off from the lower part of the stem; bracts in 3 to 5 rows, those of the outer rows small, irregular in shape, usually bifid, ciliate, those of the inner 2 rows much larger, extending beyond the middle of the perianth, ovate, irregularly lobed and ciliate in the upper part; perianth ovate-fusiform, composed of a single layer of cells, strongly curved postically in the upper part, deeply 3-carinate with obtuse grooves and keels, the mouth strongly contracted and plicate, ciliate; ripe capsule and andrœcia not found.

Stems 0.5–1 cm. long, 0.09–0.12 mm. in diameter; leaves about 0.3 mm. long and 0.2 mm. wide; leaf-cells rectangular or quadrate, with thickened walls, mostly between 0.025 and 0.028 mm. long and between 0.014 and 0.016 mm. wide; under leaves of the stem 0.09–0.12 mm. long, and 0.14–0.16 mm. wide; inner perichætial bracts 2.5 mm. long and 1 mm. wide; perianth about 4 mm. long and 1 mm. wide.

Hab.—Among Sphagna in a bog. often accompanied by *Mylia anomala* (Hook.) S. F. Gray; Lebanon Swamp, Bethany, Connecticut (A. W. E., 1892).

Lepidozia sphagnicola belongs to Dr. Spruce's sub-genus *Micro-Lepidozia*, of which our only other Northern representative is *L. setacea* (Web.) Mitt. It differs from this species, which it somewhat resembles at first sight, in its larger size, in its deeply *four*-parted leaves, whose lobes are often 3 or 4 cells wide at base, in its 4-parted stem-underleaves, in its much larger perichaetial bracts, which are not deeply laciniate, and in its long, strongly carinate perianth with contracted mouth.

The species of *Lepidozia* occurring in the United States may be recognized from their leaves as follows:

- Leaf-segments extending to about the middle. *L. reptans* (L.) Dum.
- Leaf-segments extending to near the base.
  - Segments 4, 2–4 cells wide at base, basal membrane about 2 cells high. *L. sphagnicola*, n. sp.
  - Segments mostly 3, 2 cells wide at base, basal membrane 2–5 cells high, *L. setacea* (Web.) Mitt.
  - Segments 2 or 3, 2 cells wide at base, basal membrane less than one cell high. *L. chætophylla*, Spruce, var. *tenuis*, Pears.*

JUNGERMANNIA NOVAE-CÆSAREÆ, n. sp. Dioicous, pale green, varying to dark green or yellowish, growing in loose tufts or scattered about the bases of bog-plants; stems prostrate, simple or rarely dichotomous, bearing scattered, whitish radicles

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*Hepaticæ Natalenses, Christ. Videnskabs-Selskabs Forhandl. 1886, No. 3, p. 7, tab. v. (*Jungermannia nematodes*, Gottsche in Wright's Hep Cubenses; *Cephalozia nematodes*, Aust. in Bull. Torr. Bot. Club. vol. vi. p. 302; *Lepidozia nematodes*, Spruce, Hep. Amaz. et And. p. 366, not *L. nemoides*, Tayl. Syn. Hep. p. 717).

in the lower part; leaves of the sterile stems usually distant, plane, quadrate or broadly ovate-quadrate, more or less narrowed at the base and very obliquely inserted, not decurrent, divided by an obtuse or lunulate sinus into 2 unequal, usually obtuse lobes, the antical being the larger, margins entire; leaves of the fruiting stems broader, less obliquely inserted often imbricated, irregularly 2–4-lobed, increasing in size toward the perianth; underleaves occasionally present, lanceolate or ovate-lanceolate, entire, free or connate with one or both adjacent side-leaves; ♀ bracts large, often broader than long, quadrate or orbicular-quadrate, 3–4-parted with narrow sinuses, lobes acute or obtuse, entire, sinuate or somewhat subdivided; bracteole single, ovate or obovate, entire or 2-lobed, connate with the innermost bract; perianth terminal, long-exserted, erect, cylindrical, obtusely 5-carinate to below the middle, composed of a single layer of cells in the upper three-fourths, thence of 2 layers down to very near the base, where it becomes 3 or 4 cells in thickness, the mouth contracted, minutely and irregularly denticulate; capsule small, oval; spores muriculate, reddish-brown, elaters similarly colored; perigonial spike tinged with purple, at first terminal but later innovating from the apex; bracts 2 to 5 pairs, imbricated, complicate, bilobed with obtuse lobes and sinus, oligandrous; gemmiparous stems small, or often depauperate, bearing the minute oval gemmæ at their apices and on the margins of modified upper leaves.

Sterile stems about 1 cm. long and 0.18 mm.–0.25 mm. in diameter; fertile stems longer and thicker; leaves of the sterile stems usually between 0.9 and 1.1 mm. in length and breadth; leaf-cells medium-sized, polygonal, thin-walled, usually between 0.034 and 0.046 mm. in diameter in middle of leaf, but sometimes below 0.030 mm. and more rarely above 0.050 mm.; inner perichaetial bracts 2–2.5 mm. long and 1.75–2 mm. wide; perianth 3 mm. long and 0.8 mm. wide; spores mostly 0.012–0.014 mm. in diameter; elaters 0.1 mm. long and 0.008 mm. thick.

Hab.—In peat bogs; Atsion and Pleasant Mills, New Jersey (A. W. E.); in a wet path through boggy ground, East Haven, Connecticut (A. W. E.).

In spite of the occasional presence of underleaves, this species bears some resemblance to *Jungermannia incisa*, Schrad.; it differs from that species most markedly in its pale color and looser habit, in its usually 2-lobed and explanate leaves with entire margins, and in its cylindrical perianth; its leaf-cells, too, are larger, less chlorophyllose, and with thinner walls.

New Haven, Conn.

Explanation of Plates.

(PLATE CLXII.)

Lepidozia sphagnicola, n. sp.

Fig. 1. Plants, natural size.
Fig. 2. Part of stem, postical view.
Fig. 3. Stem-leaf.
Fig. 4. Branch-leaf.
Fig. 5. Stem-underleaf.
Figs. 6–8. Branch-underleaves.
Fig. 9. Inner bract.
Fig. 10. Perianth.

(PLATE CLXIII.)

Jungermannia Novæ-Cæsareæ, n. sp.

Fig. 1. Plants, natural size.
Fig. 2. Apex of stem with perianth, postical view.
Fig. 3. Antheridial stem, antical view.
Figs. 4–5. Parts of sterile stems, postical view.
Figs. 6–7. Perichaetial bracts (fig. 7 showing connate bracteole).
Fig. 8. Transverse section of perianth.
Fig. 9. Teeth from mouth of perianth.

A Study of the Scale-characters of the Northeastern American Species of Cuscuta.

BY W. D. MATTHEW.

(PLATES CLXIV.–CLXV.)

In the schemes for the classification of *Cuscuta*, the scale-characters are given but small prominence, though it would seem that as a convenient means of distinguishing the species one from another they may be of considerable service. They vary a great deal in the different species, but are apparently quite constant in each and seem to belong to two or three distinct types. The classification here made is intended rather as a key than as any attempt at a systematic division.

The scales may be separated from the first into two types, one of which is deeply crenulate, the other fringed with processes. To the first class belong the two introduced species, *C. Epilinum* and *C. Epithymum;* to the second all our native species. The latter may be divided into those with ovate scales and short, irregular processes, of which *C. arvensis* is a type; and those with ribbon-shaped scales and long regular processes, of which *C. Gronovii* is a type. One species, *C. cuspidata*, is intermediate in scale-characters between these two divisions, though nearer to the type of *arvensis;* and three others have the scales greatly reduced, of which one, *C. Coryli*, is closely connected with *C. indecora*, of the *arvensis* type; another, *C. Polygonorum*, seems related to *C. arvensis* itself; and the third, *C. Cephalanthi*, has the scales of moderate size and also of this type.

The long-fringed scales are remarkable in their shape, and are fringed thickly at the tip, but very sparingly towards the base, with long rounded processes. In two of the species, *C. Gronovii* and *C. rostrata*, they appear softer and more flexible than in the other two; but the chief reliance in separating these must be placed on the corolla lobes and on the serrate bracts which surround the calyx in the two last species.

While this division of our Northeastern American species is by no means as exact as that ordinarily given; yet as it depends only on characters observable in the dissected flower, it may be found at times more convenient than that based on the position of the withered corolla on the fruit, a point only seen in fruiting specimens, and then not always easy to determine, as the corolla in some species soon falls away.

DIVISION OF CUSCUTA ACCORDING TO SCALE-CHARACTERS.

I. Scales crenulate.

* Scales not incurved, less than one-half as long as the corolla-tube, crenulate at ends . . . . 1. *C. Epilinum.*

* Scales strongly incurved, about one-half the tube length, crenulate to the base. . . . . 2. *C. Epithymum.*

II. Scales fringed with processes.

* Scales large, ovate, heavily fringed to the base with short, irregular processez.

† Corolla lobes recurved, acute, as long as tube. . . 3. *C. arvensis.*

†† Corolla lobes incurved, broad triangular, half as long as tube. 4. *C. indecora.*

** Scales small or nearly aborted (but apparently similar in general type to the last division).

† Scales variable, almost aborted, tips of corolla lobes inflexed. 5. *C. Coryli.*

†† Scales small, irregularly fringed, lobes of corolla ovate, less than one-half length of tube, their tips not incurved . . . 6. *C. Cephalanthi.*

††† Scales reduced to a couple of hairs on each side of the attached part of the filament . . . . 7. *C. Polygonorum.*

*** Scales of moderate size, fringed to the base with rather short, regular hairs. Corolla lobes acute, half the length of the tube . . . . 8. *C. cuspidata.*

**** Scales long, fringed chiefly at the tip, sparingly towards the base, with long regular processes.

† Processes rather softer and more flexible; no serrate bracts on calyx.

‡ Corolla lobes nearly as long as tube . . . . . 9. *C. Gronovii.*

‡‡ Corolla lobes less than half as long as tube . . 10. *C. rostrata.*

‡‡ Processes stiffer and rounder; serrate bracts surrounding calyx.

‡ Corolla lobes ovate; bracts few in number, broad and serrate. 11. *C. compacta.*

‡‡ Corolla lobes acute; bracts numerous, narrow, serrate, recurved at tip . . . . 12. *C. glomerata.*

Following is a short description of the characters of each species, with special reference to the scale characters. For a more complete description of other characters, reference should be made to Engelmann's studies on the genus:

C. EPILINUM.—Flowers sessile, 5-parted, in small round dense heads. Calyx of 5 broad-pointed spreading sepals, as long as the corolla tube. Corolla lobes half as long as tube, broad, blunt-pointed. Stigmas filiform; stamens with short filaments and broad anthers. Scales less than half length of tube, divided at centre, fringed at ends with about 4 or 5 deep crenulations, thin in substance. Capsule regularly circumscissile, capped by the withered corolla.

C. EPITHYMUM.—Flowers 5-parted, sessile in small round dense heads. Calyx of narrow pointed sepals, ⅔ length of corolla tube. Lobes of corolla nearly as long as tube, rather broad, acute pointed. Stigmas filiform; stamens with short filaments and long anthers, the two lobes of the latter strongly furrowed. Scales thin, strongly incurved, half length of tube, fringed nearly to the base with deep irregular crenulations. Capsule regularly circumscissile, capped by the withered corolla.

C. ARVENSIS.—Flowers 5-parted, on short pedicels, in rather loose clusters. Calyx lobes very broad and blunt pointed, not exceeding corolla tube. Corolla lobes recurved, acute, as long as tube. Stigmas round (as they are in all the succeeding species); anthers broad. Scales large, confluent at base, broad-ovate, equalling or exceeding tube, profusely fringed from tip to base with short irregular processes.

C. INDECORA.—Flowers in large loose clusters. Calyx lobes ovate, pointed, shorter than corolla tube. Corolla bell-shaped, lobes triangular, minutely crenulate, two-thirds length of tube, their tips incurved. Scales large, broad, ovate, confluent, irregularly, fringed with short processes to the base.

C. CORYLI.—Flowers in loose clusters, 4–5 parted. Calyx lobes triangular to lanceolate, equalling length of corolla tube. Corolla narrow bell-shaped, lobes acute, minutely crenulate, about equalling length of tube, strongly inflexed. Scales very small and thin, separate at base, with a few short hairs on each side.

C. CEPHALANTHI.—Flowers 5-parted, in rather dense clusters. Calyx lobes ovate, ⅔ length of corolla tube. Lobes of corolla blunt, ovate, spreading, half the length of tube. Scales about half the length of tube, fringed chiefly at tip with irregular short hairs.

C. POLYGONORUM.—Flowers 4–5-parted, in loose clusters. Calyx lobes narrow, ovate. Corolla lobes triangular, longer than tube. Scales almost obsolete, consisting of two or three hairs on each side of the attached part of the filament; they are so small and thin as to be almost indistinguishable.

C. CUSPIDATA.—Flowers in large branching clusters, long and narrow, with two or three bracts at base. Calyx in specimen examined of five lanceolate lobes, ⅔ length of corolla tube. Lobes of corolla lanceolate-triangular half length of tube. Scales narrow and long, ½ to ⅔ length of tube, confluent at base, fringed from tip to base with short, moderately regular processes.

C. GRONOVII.—Flowers 5-parted, bell-shaped, in small clusters. Calyx ⅔ length of corolla tube of 5 long, ovate lobes. Corolla lobes nearly equalling length of tube, rounded, ovate, spreading. Scales narrow, ribbon-like, equalling or slightly exceeding the tube, fringed thickly at tip and very sparingly along the sides, with long cylindrical processes, each about half the length of the scale.

C. ROSTRATA.—Flowers large, loosely clustered. Calyx of 5 broad, ovate-triangular lobes, about ⅓ length of corolla tube. Corolla lobes broadly ovate, about ⅓ length of tube. Scales somewhat variable, ribbon-shaped to spatulate, fringed at tip and sparingly on the sides with processes similar to those of the last species.

C. COMPACTA.—Flowers sessile in dense masses, having 3 or 4 solid-ribbed rhombiform bracts, and a calyx of 5 separate sepals, which are oblong, blunt-pointed, thinner than the bracts, otherwise very similar to them. Corolla lobes ovate, about ⅓ length of tube. Scales half the length of tube, generally more or less ribbon-like, fringed chiefly at tip with long processes, which are somewhat rounder and stiffer than in the two preceding species.

C. GLOMERATA.—Flowers sessile in very dense cylindrical masses, having numerous, narrow, strongly ribbed, recurved serrate bracts, and calyx of five separate sepals, which are like the bracts, but broader and less strongly ribbed. Corolla lobes lanceolate-triangular, ¼ length of tube, which scarcely exceeds the calyx bracts. Scales ribbon-like, ⅔ length of tube, fringed copiously at tip, sparsely on sides, with processes like those of the last species.

Description of Plates CLXIV. and CLXV.

Fig. 1, a–c, C. *Epilinum*—1a, corolla laid open × 5; 1b, calyx laid open × 5; 1c ovary × 5; 1d, scale and stamen × 12.

Fig. 2, a–e, C. *Epithymum*—2a, corolla laid open × 6; 2b, calyx laid open × 6; 2c, ovary × 6; 2d, scale × 15; 2e, anther × 15.

Fig. 3, a–c, C. *arvensis*—3a, corolla laid open × 9; 3b, calyx laid open × 9; 3c, scale × 11.

Fig. 4, a–e, C. *indecora*—4a, corolla laid open × 4; 4b, calyx laid open × 4; 4c, ovary × 4; 4d, scale × 12; 4e, anther and corolla lobe × 12.

Fig. 5, a–d, C. *Coryli*—5a, corolla laid open ×6; 5b, calyx laid open ×6; 5c, ovary ×6; 5d, scale ×15.

Fig. 6, a–d, C. *Cephalanthi*—6a, corolla laid open × 3; 6b, calyx laid open × 3; 6c, ovary × 9; 6d, scales and stamens × 9.

Fig. 7, a–c, C. *Polygonorum*—7a, corolla laid open × 6; 7b, calyx laid open × 6; 7c, scale and anther × 12.

Fig. 8, a–f, C. *cuspidata*—8a, corolla laid open × 5; 8b, calyx laid open × 5; 8c, ovary × 5; 8d, scale × 12; 8e, bract × 3; 8f, flowers × 4.

Fig. 9, a–d, C. *Gronovii*—9a, corolla laid open × 9; 9b, calyx laid open × 5; 9c, ovary × 9; 9d, scale × 10.

Fig. 10, a–d, C. *rostrata*—10a, corolla laid open × 5; 9b, calyx laid open × 5; 9c, ovary × 5; 9d, scale × 11.

Fig. 11, a–e, C. *compacta*—11a, corolla laid open × 5; 11b, sepal × 5; 11c, bract × 5; 11d, ovary; 11e, scale × 9.

Fig. 12, a–e, C. *glomerata*—12a, corolla laid open × 5; 12b, sepal × 5; 12e, bracts × 5; 12d, ovary × 5; 12e, scales × 12.

Southern Botanists.*

By F. Lamson-Scribner.

Ladies and Gentlemen: At this season (March 26th) there may be found in our rich woodlands, brightening the deep shades with its pure white flowers, a little plant known to botanists the world over as *Jeffersonia.*

A more delicate tribute cannot be paid a worker in the science of botany than to name for him some new or undescribed plant. Only those who by their direct labors have increased our knowledge of the vegetable kingdom, or who have in some way materially aided in the advancement of the science, have been thus honored.

It is the purpose of this lecture to pass in review some of those who have been thus distinguished in the annals of American botany, or who have thus become identified with the plants of the Southern States. The number is far too great for all to be included in a popular lecture, nor can I claim your time to say all that I would like to say of those even who are ranked most prominent.

Jeffersonia diphylla commemorates one whose name and fame are so well known to all that I scarcely need more than mention him. Although Jefferson was not a botanist, his recognition of the science and the successsul encouragement which he gave to its prosecution will ever be remembered by botanists in the plant which bears his name. In the development of our nation and national politics this name will ever stand among the first and foremost, and in the development of natural history in America it holds a no less prominent position. "It is probable," says G. Brown Goode, "that no two men have done so much for science in this country as Jefferson and Agassiz; not so much by their direct contributions to knowledge as by the immense weight they gave to scientific interests by their advocacy."†

To Jefferson's interest and influence was due the organization of the first government exploring expedition, that of Lewis and

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*A lecture delivered at the University of Tennessee, March 26, 1889.

† "The Beginnings of Natural History in America." Liberal use has been made of this address by Prof. Goode in the preparation of this lecture. F. L. S.

Clark, into the far Northwest—the precursor of all like enterprises carried on by the general government, culminating in the present magnificent Geological Survey,

A little incident illustrating Jefferson's scientific enthusiasm is thus related. On going to Philadelphia to be inaugurated Vice-President, he carried with him a collection of fossil bones which he had obtained in Green Brier county, Virginia, together with a paper in which were formulated the results of his studies upon them. This was published in the Transactions of the American Philosophical Society, and the animal which the bones illustrated is still known as Megalonyx Jeffersoni. The spectacle of an American statesman coming to take part as a central figure in the greatest political ceremony of our country, bringing with him a lot of bones and an original contribution to science is one long to be remembered, and is not likely soon to be repeated. Botanists have done well to preserve in their special field the memory of this man, remarkable as he was great.

A tropical American genus of woody climbers, Banisteria of Linnæus, was dedicated to John Bannister, who settled in Virginia some time prior to 1668, and who published in 1686 a "Catalogus Plantarum in Virginia Observatarum," which was the first systematic paper upon natural history emanating from America. He was an artist, for with his notes and dried specimens transmitted to Bishop Compton and John Ray, of England, he sent drawings of the rare species which he found. Ray says of Bannister in his "Historia Plantarum," "erudissimus vir et consummatissimus Botanicus."

The memory of John Bannister is still cherished in Virginia where his descendants are numerous.

That attractive little spring flower *Claytonia Virginiana*, which enjoys the honor of having been the first to fall into the hands of Dr. Gray, when a student, to be analyzed by him, and which with one or two others disputes the right to be recognized as the "May Flower" of our ancestors, keeps fresh in our memories one of the earliest devotees of botanical science in America, John Clayton, of Virginia. For fifty years Clayton was clerk of Gloucester county and during all this period he spent a great deal of time in exploring the region about him and in describing the plants which he found.

He was a correspondent of Gronovius and also of the great Linnæus, both of whom afforded him much aid in his botanical pursuits. Clayton's "Flora Virginiana," the first of its kind in this country, began to appear in 1739, subsequent portions being published in 1743 and 1762. At the time of his death he left two volumes of manuscripts, and an herbarium with marginal notes and references for the engraver who should prepare the plates for his proposed work. All this material, the result of many years of labor, was destroyed by fire during the Revolutionary War, and thus perished what was probably one of the most important works on American botany written before the days of Gray and Torrey.

The author of the first work written in America on the principles of science (Botany and Zoölogy), was, like Clayton, a resident of Virginia. The low-creeping, evergreen vine, known to every one as Partridge-berry, was named by Linnæus in honor of this author, Mitchella repens. Dr. John Mitchell was born in England, but he early came to Virginia where he spent nearly fifty years practicing medicine and promoting science. He was a man of broad culture and was one of the earliest chemists and physicists in America. His political and botanical writings were numerous and were always well received, and Mitchell's map of North America is still an authority in boundary matters. It has been said of Mitchell and Clayton that together they gave to the botany of Virginia a distinguished lustre.

Mark Catesbey spent a dozen years in Virginia and the Carolinas, from 1712 to 1725, collecting and making paintings of birds and plants, and his magnificent, illustrated work on the Natural History of Carolina, Florida and the Bahamas, is still of very great value to students. A Rubiaceous genus of the Antilles perpetuates his name.

John Bartram, whose home was near Philadelphia, but who extended his botanical explorations into some of the Southern States, was styled by Linnæus "the greatest natural botanist in the world." He was made botanist to His Majesty for the Floridas by George III., and was given a pension of 50 pounds a year. He was a collector rather than an investigator, and did botany great service by supplying plants and seeds to Linnæus and other European botanists. He is best remembered in the so-called Bartram oak, Quercus heterophylla, and in the unique botanic garden which he established on the banks of the Schuylkill, near Philadelphia.

An herbaceous plant of the Old World, Michauxia, commemorates the author of the first "Flora of North America," and the most untiring explorer this country has ever seen. Although André Michaux the elder cannot be ranked as a Southern botanist, as he spent only a few years in the Southern States, he so identified himself with our flora, and being the first botanist to cross the mountains, in 1795, from the East into Tennessee and Kentucky, that we cannot pass him wholly unmentioned.

Of the 1700 species of plants enumerated in Gattinger's "Tennessee Flora," over 135 were originally described and named by Michaux, and many of these were found by him, some for the first time, within our State limits. Michaux, with his son's assistance did more than any other man to diffuse a knowledge of our forest trees, particularly the oaks. His "Flora" was published in 1803.

Passing over a number of names scarcely less noteworthy than those already mentioned, we come to those who have been most active in the investigation of Southern plants within the present century.

A yellow-flowered composite plant of the sand hills of Georgia and Florida, named by Nuttall, *Baldwinia multiflora*, calls up before us one of our pioneers in the field of botany, Dr. William Baldwin. Dr. Baldwin was born in Pennsylvania in 1779, educated at the University of that State, and in 1811 removed to Georgia. He was a man much beloved by his associates, of whom Stephen Elliott was one, and was possessed with a most amiable character. He studied very minutely the difficult family of sedges, and the yet more difficult genera of grasses, *Paspalum* and *Panicum*. One of his best botanical papers was published in the Trans. Am. Phil. Soc., of Phila., and another in the American Journal of Science, the first relating to sedges, the second to grasses. He was appointed botanist to the expedition under Maj. Long, but his health, never very strong, failed completely during the journey to the field, and he died at Franklin, Mo., in the forty-first year of his age. His collections of Southern plants are now in the Herbarium of the Acd. Nat. Sci., of Phila., where they are guarded with care and justly prized.

Muhlenberg, in Nuttall's "Genera Plantarum," did honor to one of the most distinguished of our early botanists by naming for Stephen Elliott, a shrub of the Heath family, which grows in the dry, rich soils of Southern Georgia, *Elliottia racemosa.* Elliott was born at Beaufort, S. C., in 1771. He was educated at Yale, and while a senior in college he was spoken of as being possessed of more science and general information than was often found in one of his age and standing. He graduated with one of the highest honors, and returning home applied himself to agricultural pursuits. The people of his State, recognizing his marked ability, elected him first to the State Legislature, and then to the Senate. While a member of the latter body he took a leading part in all important business, and was the originator of the "free school system" of South Carolina, and the Bank Bill creating the "Bank of the State."

He was for a time President of the South Carolina College and later Professor of Botany and Natural History in the Charleston Medical College. He was the first, and during his lifetime the only President of the Philosophical Society of Charleston. The versatility and vigor of Mr. Elliott's mind may be seen in the variety of attainments in which he excelled. Beginning his career as a legislator, in which capacity he served for many years, he took prominent and leading parts in many of the important measures of his day. And it was while engaged in public and in engrossing financial business that he found time for literary and scientific pursuits, which alone would have placed him in the foremost rank among men of letters.

Botanists remember and esteem Elliott for his grand work entitled a "Sketch of the Botany of South Carolina and Georgia," published in two volumes in 1821 and 1824. The technical descriptions of the species enumerated are given in both Latin and English, and these in each case are followed by a more extended account in English in which are given the habitat, time of flowering, local names and often the reputed medicinal properties and other points of historical interest. The whole work, embracing

1349 pages, together with a dozen finely executed plates illustrating 48 species of sedges and grasses, exhibits great scientific accuracy and an unusual amount of care in its preparation. Such was the work which the author modestly styles a "sketch." It was the chief authority among botanists for this latitude prior to the appearance of Chapman's "Flora of the Southern States," in 1860, and to-day it is one of the works which all working botanists feel that they must possess or be able to consult. Until one has written a book, and especially a book where almost every line is the statement of a fact learned, for the most part, from original observation, can they appreciate the amount of patience and labor involved in the preparation of such a work as Elliott's "Sketch of the Botany of South Carolina and Georgia."

In the preface to the second volume, Elliott, in acknowledging his indebtedness to others for assistance, briefly refers to several botanists who come within the scope of this lecture, and I cannot do better than to quote Elliott's own words in speaking of them. "To those who have aided in collecting the plants from which this sketch has been compiled, the author feels his manifold obligations; he wishes to express them particularly to Mr. James Jackson, of Louisville, Ga., from whom he has received many new and many rare plants and whose notes have always rendered his specimens more valuable. To Samuel Boykin, of Milledgeville, who, residing in a most interesting district of country, has added much to the author's knowledge of its flora by the valuable collections of specimens occasionally sent him.

"To Mr. N. Herbemont, of Columbia, S. C., for many specimens of rare plants collected around Columbia and in the upper districts of Carolina.

"To Dr. William Baldwin, of the United States Navy, a botanists of distinguished talents and indefatigable activity, who while residing in the southern districts of Georgia, communicated many new species published in the earlier portions of the "Sketch."

"But principally to the late Dr. James McBride, a tribute is due, not only for the services which he himself actually rendered, but for the contributions which he induced others to offer. Devotedly attached to science, he had the talent to make it popular wherever his influence extended. Profoundly skilled in his profession and high in the confidence of his fellow citizens, he fell a victim to the fatigues and exposure of an extensive practice. In the midst of a brilliant career, with prospects of increasing usefulness and extended reputation, he died at the early age of 33."

In dedicating to this gentleman the genus, *Macbridea*, Elliott says, " I have named this genus in commemoration of the late Dr. James McBride, whose untimely death, medicine and natural history and an admiring country equally deplore."

There are a number of plants in our flora, both among phanerogams and cryptogams which have been named for Rev. Moses A. Curtis, of North Carolina, a most acute botanist and a gentleman whose character and ability reflect honor upon the State in which he lived. Curtis was born in Berkshire county, Massachusetts, in 1808, and at the age of 22 came to Wilmington, N. C., as a tutor in the family of Governor Dudley. He began at once to devote himself to the study of the flora of that region, which was especially rich and interesting. Close up to the village reached the pine forests, abounding in strange plants that charmed the eye and filled the portfolios of the enthusiastic young botanist. His quick eye and assiduity may be judged by the fact that in little more than two seasons during his brief hours of leisure he made a collection of over a thousand species, or rather more than half the number described in Elliott's Botany. The result of these two years' investigation appeared in 1834, in Curtis's " Enumeration of the Plants Growing Spontaneously around Wilmington, N. C.," published in the Boston Journal of Natural History. This first contribution to botany by Dr. Curtis was more than a mere catalogue, and it attracted the favorable notice of his teachers and correspondents. It was so thorough that after the lapse of half a century only about 50 species have been added to his list. Among some of the new plants which he found near Wilmington was the curious and very local *Dionæa muscipula*, or Venus fly-trap. Week after week he would visit the savannas, and, lying at full length upon the ground, would watch the peculiarities of this plant, and the description which he gave of its habits in his first published work has been many times quoted during the last 50 years, showing that he possessed the gift of accurate and entertaining description to a marked degree.

In 1835 Curtis was ordained to the ministry of the Episcopal Church and immediately entered upon mission work in Western North Carolina. He spent a year in this work, and while thus engaged he took advantage of his journeying in the solitary woods to pursue his botanical researches. He traveled mostly in a sulky which was so arranged that his collecting portfolios could be placed under the cushion of the seat. As he came across specimens he would gather them, put them into the portfolios, and so by the end of his journey he had secured a goodly number of ready pressed plants for future study or for mounting in his herbarium. In 1849 he again visited the mountain region, and in 1841 it was said of him by Dr. Gray that "no living botanist was so well acquainted with the vegetation of the Southern Alleghany mountains, or has explored those of North Carolina more extensively."

Dr. Curtis' method as a student was that of a broad-minded scientist; just to name a flower and preserve it was to him but the beginning of his work. His earliest records show that he studied the relations of plant life to geologic and climatic surroundings. The study of botanical geography was begun with his career as a botanist and continued throughout, extending over 38 years. The account he gives us in his "Woody Plants" is to-day the best guide to the natural climatological divisions of the State which has ever been published. He also directed his attention to the numerous economic questions which met him in his intimate acquaintance with the treasures of the field and forest. It was this feature of his labors alone which brought him an audience in his adopted State. His "Woody Plants," published as a part of the State Geological and Natural History Survey in 1860, at once became a popular manual for the farmer and the woodsman, and for the amateur botanist a key to the more conspicuous trees and shrubs useful for their fruit or timber or as ornaments. The preface of this little work is an introduction to the geographical distribution of plants in the State and shows what a thorough acquaintance its author had with the broad subject.

Although Dr. Curtis is known as a man who was intimately acquainted with the flowering plants of the South, it is through his great knowledge of cryptogams, especially of fungi, that he became most widely known and justly famous. This very difficult branch of botany had few votaries in Curtis's time, and there was no text-book on the subject published in America. Provided, however, with the two well-known works of Schweinitz, Curtis addressed himself to what was for him a labor of love. He was painstaking and accurate in his methods, and the microscopic work necessary for the determination of species became with him a triumph of skill. Few were the botanists with whom he could compare specimens or exchange notes. He pursued this specialty without the stimulus now offered by special societies, and for the greater part of his career absolutely without an audience. It was intense love for the work which led him up to the highest station occupied by any American botanist. Dr. Curtis gave particular attention to the edible species of fungi. He communicated to the "Gardeners' Chronicle" for October 9th, 1869, an article on the "Edible Fungi of North Carolina," and left in manuscript a very complete illustrated work on "Esculent Fungi." Every one knows the palatable and wholesome character of the common mushroom or pink gill, but few are aware that there are other kinds growing in our fields and woods that are more finely flavored and just as wholesome. In his catalogue of the plants of North Carolina, Curtis indicates 111 species of edible fungi known to inhabit that State, and he remarks elsewhere that he has no doubt that there exist 40 or 50 more.

In a letter to Berkeley, of England, Curtis writes: "In October, 1866, while on the Cumberland Mountains in Tennessee, although with little leisure for examination during the two days spent there, I counted 18 species of edible fungi. Of the four or five species that I collected for the table, all who partook of them declared them most emphatically delicious. On my return home, while stopping a few hours at a station in Virginia, I gathered eight good species within a hundred yards of the depot. And so it seems to be throughout the country. Hill and plain, mountain and valley, fields and pastures, swarm with a profusion of good nutritious fungi which are allowed to decay where they spring up, because people do not know how, or are afraid, to use them."

In 1867 the State published as a part of the Geological and

Natural History Survey, a "Catalogue of the Indigenous and Naturalized Plants of North Carolina," by Dr. Curtis. This Catalogue included 4,800 species, and was the first attempt made by any botanist in this country to enumerate the cryptogams as well as the flowering plants, and its appearance was a matter of much scientific congratulation. This work was the result of 25 years of botanical study over a territory of 50,000 square miles.

The most important purely scientific papers of Dr. Curtis were his contributions to the mycology of North America, published in several volumes of Silliman's Journal.

A genus of plants, *Ravenelia*, belonging to the same family as the rust of wheat, perpetuates the name of Dr. Henry W. Ravenel, of South Carolina. At the time of his death, less than four years ago, there were among American botanists none more respected and beloved and few whose scientific work covered so many years of activity.

Born with a fondness for natural history, Ravenel pursued his botanical studies with great earnestness and enthusiasm during the whole of his long life. He made extensive collections of plants, but he was no ordinary collector, heaping up rough material to be exchanged for specimens to be counted rather than studied. He was a most accurate observer, and always noted the habits and peculiarities of the plants he gathered. There was not a group of plants, no matter how small, which escaped his observation. He not only studied critically the phanerogams of his State, but he collected and studied as far as it was possible in his time and in a region remote from large libraries, mosses, lichens, algæ and fungi. He was a zealous follower of Dr. Curtis, and became recognized as authority on the species of fungi in the Southern States, for no one possessed such an intimate acquaintance with them. He discovered many new flowering plants and a surprisingly large number of cryptogams. His interest in the latter group brought him into correspondence with the leading mycologists of Europe, and Ravenel became nearly as well known abroad as at home. He is best known to the botanists of to-day by his published sets of fungi, a dozen volumes or more, which are now rare and exceedingly valuable. His writings are not numerous, but they are characterized by thoroughness and indicate an active mind which went beyond mere descriptions and inquired into causes as well as results. His work was not solely for the scientific world; he was for many years botanist to the State Board of Agriculture and an editor of an agricultural paper. His popular articles on the grasses of the South are of special interest and value, for he devoted much attention to these plants and appreciated their agricultural importance. He is spoken of as having been a man whose life was full of kindness to all about him and an example of what a botanist should be.

Among the Southern botanists who have worked in this field and become identified with Southern plants are many who have attained distinction through their labors, but of whom I have not the time to speak. I must, however, mention the names of Lindheimer and Fendler, whose collections have become classical through the publication of Engelmann and Gray; of William F. Feay, of Georgia, whose devotedness to botany led to a number of interesting discoveries; of Prof. John L. Riddell, who for many years resided at Mobile, and whose name is indelibly associated with botany through the genus Riddellia; of S. B. Buckley, who discovered and published many new species of Southern plants, and for whom *Buckleya distichophylla*, a graceful Santalaceous shrub of the mountains of North Carolina was named; of Dr. C. W. Short, of Kentucky, justly famous in his time and whose services were recognized by Dr. Gray in that extremely rare plant found only near Roan Mt., *Shortia galacifolia;* of John Williamson, of Kentucky, the artist botanist whose "Fern Etchings" gained him a world-wide reputation; of Le Conte, of Georgia, who monographed our species of the genus *Paspalum;* and lastly, but by no means least, of Dr. Engelman, of St. Louis, Mo., whose botanical works placed him in the first rank of men of science and whose publications will always be essential to every working botanist.

Passing over these thus briefly, we come to those who are yet living and still active in the cause.

We cannot omit speaking of Judge M. Thomas Peters, of Moulton, Ala., although he is no longer actively engaged in botany. Judge Peters was one of the first to draw the attention of botanists to the ferns of his State and was the discoverer of that beautiful little species named in his honor, *Trichomanes Petersii.*

There are numerous private as well as public herbaria, both in this country and in Europe, that owe many of the treasures they possess to the kindness and generosity of Judge Peters. He brought to light that rare and curious sedge, *Carex Boottiana*, and he was one of the earliest students of the fungi of Alabama. His collections of this class of plants as well as his botanical library he donated to the Alabama State University.

The discoverer of the very rare *Neviusia Alabamensis*, the Rev. R. Nevius, should be named in passing, although he is now stationed on the Pacific coast. He communicated many interesting Southern plants to Dr. Gray, and in his new field of labor he is continuing his botanical studies, paying particular attention to mosses.

Louisiana is at this time the fortunate possessor of a most industrious and acute botanist in the person of Rev. A. B. Langlois, of St. Martinsville. Mr. Langlois was born in France in 1832, and he began his botanical studies in that country, for before coming to America in 1855, he had made an herbarium of some 1200 species. He spent nearly two years in Cincinnati completing his ecclesiastical education, and then located at Point-a-la-Hache, La., where he remained for thirty years. The locality being near the delta of the Mississippi was one of peculiar botanical interest, and Mr. Langlois succeeded in discovering many rare and some new species of plants. Langlois has carried on his botanical studies under circumstances which would have deterred many from undertaking them. He has been entirely cut off from botanical associates, and the climate of his region is so moist as to render the drying of specimens most difficult. Upon going to Point-a-la-Hache, he at once renewed his botanical work, but being entirely without books and wholly unacquainted with any American botanist, he sent his first collections, numbering some 300 species, to France to be named, but he never heard from them or received one word of encouragment. Evidently disheartened he dropped the study of plants for twenty years, a period which he now looks upon with deep regret. In 1878 he began again the study, first with only Wood's "Manual," and then with Chapman's "Southern Flora." Langlois thus relates his progress from this time, "By accident I learned that there was a botanist, Dr. Puissant, at the Ecclesiastical Seminary of Troy, N. Y., and I immediately wrote to him offering Southern plants for Northern ones, and I received from the doctor about 500 species. Soon after I found out there was published here a "Botanical Gazette," for which I immediately subscribed. From this journal I learned many things unknown to me before; through its advertisements I got plants from Eggert, of Missouri, Pringle, of Vermont, and a check-list from Patterson, of Illinois. Then I began to know and appreciate the advantages of having correspondents. The ones who have been of greatest service to me in phanerogams are Morong, of Massachusetts, Wibbe, of New York, and later, J. Donnell Smith, of Baltimore. In grasses I have been assisted by Dr. Vasey, of Washington, and in Cyperaceæ by Connant.

"In 1884, through the kindness of Mr. Lehnert, of Washington, I began the study of mosses, liverworts and lichens, and in the latter part of 1885, at the suggestion of Mr. Scribner, I began the study of fungi. I soon acquired a deep interest in these plants, and have been greatly aided in their study by Prof. Ellis, of New Jersey. The mycological flora of Louisiana being so rich and at the same time so poorly known, I have for the past three years given almost my entire attention to it. Every day I make new discoveries, and I am yet far from having exhausted this intensely interesting part of the Louisiana flora." Mr. Langlois has now an herbarium containing some 5000 species of North American plants, including 1214 species of Phanerogams and vascular cryptogams of his State. So far as his State is concerned, this work has been done single-handed. About a year ago, Langlois published a catalogue of Louisiana plants which embraced the fungi he had found, now numbering 1200 species. Langlois' collections are widely distributed in the herbaria of this country and in France, and his specimens are highly valued by all who possess them.

I have been thus particular in speaking of Mr. Langlois, not only to show the interest that may be acquired in the study of botany, but also to show what may be accomplished under conditions most adverse. Mr. Langlois is now rector of St. Martin's church, St. Martinsville, La.

For many years botanists of this country, when they have wished specimens of Southern plants or have desired to learn more about them, have turned by almost common consent to Dr. Chas. Mohr, a druggist of Mobile, Alabama, a German by birth. An assiduous explorer and collector, an acute observer of plants and a generous correspondent, freely communicating to others the results of his labors, Dr. Mohr has won the esteem and confidence of all American botanists. Nor is his reputation confined to this side of the Atlantic, for some of his botanical communications to the German scientific journals have been translated into all the leading languages of Europe. What he has accomplished for the science of botany has been done in the hours of recreation which he could command in a pretty hard struggle for an existence in his calling as pharmacist. During the first years of his residence in this country, from 1857 to 1865, he devoted the limited hours he could spare for rest or recreation to the study of mosses, and the specimens he collected of these plants were sent to the leading bryologists of this country and Europe. He greatly assisted Lesquereux and James by furnishing material for their work on the mosses of North America, and the many new species which he found were published in the BULLETIN OF THE TORREY BOTANICAL CLUB under the title of "Contributions to the Bryology of the United States."

In 1886 Mohr acquired the valuable herbarium of Dr. J. Riddell, of Louisiana, author of a "Catalogue of the Plants of Louisiana" and of a "Synopsis of the Plants of the West." This herbarium contained the extensive collections of Dr. Josiah Hale, of Alexandria, Louisiana, as well as those of Prof. W. M. Carpenter, and was to Mohr "a mine of wealth and information." At about the same time he had placed in his hands for determination the valuable collection of Dr. Denney, of Luggsville, La., from which he got a glimpse of the richness of the arboreal flora of Southern Alabama beyond the pine belt proper. The study of this collection inspired him with a special interest in woody plants and in forestry, and his work in this field of botany now stands second to none. The results of a season spent in the field of 1877 form the chapter on the "Forests of Alabama," published in 1878 in Birney's Handbook. This paper more systematically arranged, corrected, and new points of special interest to the subject added, was afterwards published separately.

For a time connected with the State Grange, Dr. Mohr directed his attention to the grasses and forage plants, with particular reference to those best adapted for cultivation in the coast region of the Gulf States. In this connection he first pointed out the value of Mexican clover and Lespedeza striata. His investigations on these plants were fully published in the reports of the U. S. Department of Agriculture. He also communicated frequent articles to the local papers on this and kindred subjects.

Many interesting waifs from foreign countries have been introduced on ship's ballast around Mobile, and the studies Mohr made of these plants led to the publication in the "Botanical Gazette" of a paper "on the plants introduced into the Gulf States." Further experiences on the same subject gained during the succeeding ten years furnished the theme for an article published last August in the "Pharmaceutical Revue" (German), on "Plant immigration in the Southern States through the aid of animals or accidently by man."

In 1880 Dr. Mohr was called upon by Prof. Sargent to undertake the investigation of the forests of the Gulf States, in regard to their timber resources and other products and the industries dependent on them. This work kept him engaged in the field during all of one season and part of another. The results of his observations were reported to Prof. Sargent and published in the ninth volume of the Tenth Census report. While in the field Mohr discovered several new species and rediscovered a number that had long been lost sight of. His observations also furnished him materials for an article on forest trees of the Gulf region published in Vol. I of the American Journal of Forestry, and another on "The Forests of the South and their Bearing upon the Interests of Agriculture," which was read at the meeting of the Southern Interstate Immigration Association at Nashville.

In 1878 Prof. E. A. Smith, of the State Geological Survey, placed in Dr. Mohr's hands the plants he had collected during his field work, and from that time dates Mohr's undertaking to get up an herbarium for the Survey to be placed in the museum of the University of Alabama. Uniting his own collections with those of Prof. Smith as a basis, the work has progressed so that now the herbarium contains something over 2200 species of flowering plants and ferns, nearly completely illustrating the entire State Flora.

In 1882 or 1883, Dr. Mohr was engaged by the Louisville R. R. Co. to collect and report upon the products of the forest and fields along the line of its road within the State. The collections made formed a most interesting and attractive feature in the Exposition held at Atlanta and at Louisville, and in 1884–85 they were again exhibited at New Orleans. An account of the material gathered was published in a pamphlet entitled "The Natural Resources of Alabama," one of the few papers of its kind which possesses real scientific merit and in no way can mislead the reader or prospective settler.

A paper on the "Resiniferous Pines of the South and the Manufacture of Naval Stores," published in the *Pharmaceutical Review*, attracted the attention of the present chief of the Forestry Division of the U. S. Department of Agriculture and led to the engagement of Mohr to prepare for the Department a series of exhaustive monographs on the Southern pines of economic importance, to form a part of a report to be devoted to the biology of North American timber trees.

Mohr is possessed with a true scientific spirit and great enthusiasm in his botanical work. By the amount he has accomplished it is very evident that he has well improved his hours of leisure and doubtless stolen much time from his hours of needed recreation. But in this day and generation one cannot stop to recreate, for if he does, some more zealous worker will win the prize he seeks. Success from true merit seems now to depend upon one's powers of endurance.

Mohr has the distinction of having gone out of the beaten track of systematic botanists and considered the plants he studied from an economic aspect. He has not only increased the sum of our knowledge, but he has added to our powers of direct usefulness. I would say to those who, in referring to botany, are ever asking the question "*cui bono?*" carefully read the writings of Dr. Mohr; they afford a most able answer.

A leguminous plant found only in Florida was named by Drs.

Torrey and Gray, *Chapmania*, in honor of him who is now the oldest of living botanists, Dr. A. W. Chapman, of Appalachicola, Florida.

On the 16th of May, almost sixty years ago, there landed at Savannah, Georgia, a young man from New England, who has since gained a world-wide reputation as a botanist and become more than all others identified with the plants of the South. The day following his arrival, in a stroll beyond the city limits he found that curious pitcher plant, *Sarracenia variolaris*, and with the aid of Eaton's "Manual" he determined its name. This was the starting point of a botanical career which culminated in 1860 in the production of Chapman's "Southern Flora."

In 1835 Dr. Chapman settled in Florida, where he has since resided, and during all these years his interest in or love for his chosen science has never for a moment flagged. He has always been isolated from association with botanists, if we except the brief companionship which he enjoyed with Mr. H. B. Croom, whose botanical services have been commemorated in the genus *Croomia;* but he has numbered among his correspondents all the prominent botanists in this country and many in Europe. Only seven of these were ever known to him personally, and he has outlived them all.

Dr. Chapman thus writes me, by request, concerning the origin of his principal publication—the "Southern Flora." He says:

"I believe the 'Flora' owes its existence to a suggestion of mine to Dr. Curtis about the year 1856, that we needed for the South a work something like what Gray had made for the North, and that he (Curtis) was just the man to do it. But at that time his hands were full of toadstools and he was rusty among the Phanerogams, and so turned over the matter to me, while promising every assistance in his power if I would undertake the job. My time also was fully occupied with my professional duties during the day, but I concluded to try my hand at it, after office hours, by way of experiment. Well, I succeeded better than I had anticipated, and was encouraged to go on, and so night after night, from 9 to 12 or 2 o'clock, for nearly three years, until 'Finis' was reached, found me at work. In the summer of 1859 I took my manuscript to Cambridge and consulted with Gray about further proceedings, the result of which was that I concluded to be my own publisher. I went to the University Press, selected the neat typography in which the work is dressed and set the printers to work—remaining with Gray, proof-reading and correcting until November, when I turned the concluding pages over to Prof. Eaton and came home. The work was issued just before the war began, and I heard nothing more of it for four years, when Dr. Gray smuggled through the lines a budget of friendly notices of the work which appeared during those years in the periodicals of this country and Europe, and all at once I awoke to bigness."

Since 1860 Dr. Chapman's Flora has been the standard botany for the Southern States, ranking with Gray's "Manual" for the States of the North. Early in 1883 Dr. Chapman published a reprint of the work, to which he added a supplement in order to include the many plants discovered within the range covered by the Flora, particularly in Florida, since the publication of the first edition. And now at the advanced age of 80 years, the doctor is actively engaged in the preparation of another edition of his Flora to meet the changes which have been made in recent years in systems of arrangement and in nomenclature. It was only the other day that I received a letter from him asking the loan of some specimens from the Gattinger Collection in order that he might settle for himself some determinations that had been brought into question. I do not know how far this new edition has progressed, but it is the hope of all botanists that this venerable, most courteous and faithful worker may live to again write the word finis and see the full fruition of his labor.

The rich and varied flora of our own State has been made known to the world by Dr. A. Gattinger, of Nashville, through his publication entitled "Tennessee Flora." Dr. Gattinger came to this State some 42 years ago and was located for a time here in the East, but he soon went to Nashville, where he has since resided. During all these years he has been an industrious collector and close observer of Tennessee plants, making many journeys to inaccessible or out-of-the-way places to discover some variety or increase his knowledge of plant distribution. Quite a number of new species have been found by him and several of these bear his name. His herbarium, of which the University of Tennessee is now the fortunate possessor, was one of the finest private collections in the country. It numbers between three and four thousand species, besides a large stock of duplicates which can be used in making further accessions to the herbarium proper. The Flora of Tennessee and the general Flora east of the Mississippi are well represented in it. The collection has been enriched through exchanges with many prominent botanists, both North and South.

Dr. Gattinger has directed special attention to the grasses of Tennessee, and he contributed the most important chapters in Killebrew's work on these plants.

His "Flora of Tennessee," published in 1887, is a work of excellent merit and at once stamps its author as a botanist of the first order. In speaking of his experience, in the preface to the "Flora," he says "I am yet in possession of specimens collected in 1849, when I first took up my residence in East Tennessee as a practicing physician. Placed as I was in those early days amid unfamiliar modes of life, with no access to intellectual resources, without information about the condition and advance of scientific affairs in this country, my botanical progress could for many years be no other than tedious and slow; but I kept up the pursuit, which since early school years had been to me a source of pleasure and consolation. His "Flora" is based upon botanical collections made exclusively by himself during 38 years' residence in the State. In it some space is given to a description of the physical characters of the State and the peculiar flora of each division, and the habitat and date of flowering of the species enumerated is given. To the students of botany within the State it is indispensable. It has not been my good fortune to meet Dr. Gattinger, but he is a most agreeable correspondent and his letters bespeak a man of high culture and refinement.

He has accomplished much by his industry and passionate love for his chosen work, and there are few names better known or held in greater esteem by the working botanists of the country than that of Dr. Gattinger, of Tennessee.

The list of Southern botanists is a long one, and contains many honorable and even brilliant names. I would that I were better able to speak of them as they deserve, but I have already put your patience to a test, and must now leave the subject with the feeling, which I know is shared by some of you, that "the half has not been told."

Some further Notes upon Serenopsis Kempii.

By Arthur Hollick.

(Plate CLXVI.)

In a previous paper* I described and figured a supposed new fossil palm, from the Cretaceous formation at Glen Cove, Long Island, under the name *Serenopsis Kempii.* Since that paper was published, another specimen, in a better state of preservation, has been found, from an examination of which some additional facts of interest have been obtained.

The two specimens are alike, except that in the one now under consideration there are thin rays or filaments irregularly interspersed between and apparently proceeding from the lower parts of many of the main rays. These are either absent in the original specimens, or else so poorly preserved as to be invisible. They appear to be portions of the main rays which have become separated or split off. It may also be noted that in places there appear to be indications of reticulation between the rays, as if they might have been connected by a membrane. If so it must have been exceedingly thin, and a careful examination of the specimens does does not warrant us in assuming it. I am inclined to think that the filamentous rays and apparent reticulations are merely portions of the main rays which have been partly torn off, leaving fragmentary connections. This appearance is strikingly like that which many palm leaves assume upon approaching maturity. Prof. Lester F. Ward, of the United States Geological Survey, from whom I requested an opinion concerning the probable affinities of the plant, does not think it a palm, but suggests that it is more likely to be allied to the organisms which have been called

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* "A new Fossil Palm from the Cretaceous Formation at Glen Cove, Long Island" (Bull. Torr. Bot. Club, xx. 168, 169, Pl. CXLIX.).

Williamsonia, whose affinities are exceedingly problematic. Thus far it has not been found attached to any stem, but the triangular apex is identical with that of many palms and is different from any part of any *Williamsonia* which I have had the opportunity to examine. It is to be hoped that future discoveries may include other parts of the plant and that its true nature and affinities may be determined beyond question.

The Jæger Moss Herbarium.

Jæger and Sauerbecks' "Genera et Species Muscorum Systematici Disposita; seu Adumbratio floræ muscorum totius orbis terrarum," was published serially between 1870 and 1878, in the Jahresbericht of the St. Gallischen naturwissenschaftlichen gesellschaft in St. Gall, Switzerland. It is a bulky volume of 1550 pages, which are not consecutive, being those of the original publication. A list compiled from it is in use at Kew as a shelf index. Besides the names, the original citations are given, with the geographical distribution and the numbers of the exsiccatæ in which the specimens have been distributed. The collection made by Dr. Jæger includes most of the numbers cited, and up to a recent date was in the possession of the Boissier Herbarium at Geneva. Through the kindness of M. Barbey, who offered the collection to us, and the generosity of several friends, it has recently been purchased and presented to the Herbarium of Columbia College.

It is undoubtedly the most complete collection of exotic mosses in this country, occupying about 90 cubic feet. It is packed in large pasteboard boxes, the specimens laid loose in species covers of the standard size. We shall incorporate it into the general herbarium, designating the specimens by an appropriate stamp. The most valuable of the European Exsiccatæ are contained in it, there being such sets as the following:

Breutel, Musci Frondosi Exsiccatæ.
Breutel, Flora Germanica Kryptogamica.
Rabenhorst, Bryotheca Europæa.
H. Müller, Westphalischen Laubmoose.
Wartman u. Schenk, Schweizerische Kryptogamen.

Limpricht, Bryötheca Silesiaca.
Jack, Leiner u Stitzenberger, Kryptogamen Badens.
Wilson, Musci Brittanici.
De Notaris, Erbario Crittogamico Italiano.
Husnot, Musci Galliæ.
F. Gravet, Bryotheca Belgica.
V. F. Brotherus, Musci Fennici Exsiccatæ.
W. Ph. Schimper, Un. itini. crypt.
Molendo, Univ. itin. crypt.

Of tropical American there are Spruce, Amazonici et Andini, a duplicate set, as Dr. Spruce sold his own private collection to us last winter; a set of F. Müller's Mexican mosses, with autograph labels, also a duplicate, as we had a fine set from the Meisner Herbarium; a set of Wright's Cuban mosses; of Bernouilli's Guatemala; Lindig's New Grenada; and a set from Venezuela, collected by Wullschlagel. Of North American sets there are only three, all duplicates. Sullivant's Musci Alleghanienses, and two sets of Sullivant and Lesquereux Musci Boreali Americani, 2d edition (1869), one of which we would gladly exchange for the first edition, which is still one of our desiderata. Among Jæger's own specimens is a set of his Musci Hispanici, and the cleistocarpous mosses which he described in his "Musci Cleistocarpici" are very fully represented.

Besides these, there are many autograph specimens from well-known bryologists, such as Schimper, J. and K. Mueller, Hampe, Winter, Juratzka, Hornschuh, Pfeffer, Bauer, Blytt, Brotherus, Reinhardt, Ruthe, Lorentz, Bamberger, Breidler, Milde, Molendo, Venturi, Mitten, Wilson, etc., including portions of many valuable types.

Of the exotic mosses, other than American and European, there are sets from Greenland collected by Melhose, from Madeira by Bauer, from Java by Van Oorschot and Lacoste, from Australia and New Zealand by King, from the Auckland Islands by Knight and St. Clair, from the Himalayas by Jacquement, from India, Sikkim by Kurz, the East Indies, Nepaul and New Zealand by Sir J. D. Hooker, Japan by Savatier, Ceylon by Hooker and Mitner, New South Wales by Wallich and others.

ELIZABETH G. BRITTON.

New Honors to Old Weeds.

By Edw. L. Greene.

The modern history of Californian botany was taken up by men who had never seen the field of their researches, and who had no conception of the number of foreign plants that had become naturalized in this part from Europe a hundred years ago. Many of these had not made their appearance in New England, and were unfamiliar to New England botanists. Several such plants, well-known to botanists in general for several centuries, obtained new names at the hands of writers of the East, as if they had been quite new to science. Dr. Britton, in the last issue of this journal, has been able to identify as old, one of my own supposed new plants; and I may here be allowed to indicate that botanists of note have added to synonymy in this manner, before me. Asa Gray, in his day, gave new names to not less than five extremely common and familiar weeds of the Old World, the specimens of which had come to him from this unsuspected habitat of California.

When, nearly twenty years ago, the present writer sent him *Convolvulus arvensis* from California, his letter in answer shows that he had considered this to be an exclusively Californian species, the *C. Californicus*, of Choisy; and when, a few weeks later, the real *C. Californicus* was transmitted, he named this *C. Soldanella*, an Old World species. But errors of this kind, of which he and other so-called "authorities" on West American botany have made scores and hundreds, do not come directly under my heading, being errors that did not go into print. The Old World *Convolvulus* to which Dr. Gray gave a new name, as a new species, and in the wrong genus at that, is a grain field weed, as common in California as in Europe—*C. pentapetaloides*, Linn., which he named *Breweria minima* (Proc. Am. Acad. xvii. 228). This error he some years afterward discovered and corrected. But there is one seeming more inexcusable which has not yet been corrected, though it was detected by me while Dr. Gray was still living; for I was loath to call his attention to a mistake, the discovery of which by another would naturally be somewhat humiliating. I refer to a new name that he gave to a plant of such ancient and world-wide repute as Pennyroyal, the *Mentha Pulegium* of Linnæus. In this error Dr. Kellogg, it must be admitted, led the way; for when the plant appeared to him he named it as a new *Hedeoma*, *H. purpurea* (Proc. Calif. Acad. v. 52). In working up the Labiatæ for the State Survey volumes, after having examined this plant minutely, Dr. Gray simply transferred it to the Californian genus *Micromeria*, where, as he remarks, it is "anomalous;" and so it stands to-day in the Synoptical Flora, as *Micromeria purpurea*, Gray. It is abundant not only on that island in the San Joaquin River, whence Dr. Kellogg and Dr. Gray had it, but also in several parts of Middle California rather remote from that station; and not more than one species of mint, *M. piperita*, has been more familiarly known in all countries during many centuries.

A dozen years ago I found by the wayside, in Berkeley, a Cichoriacea new to me, and of which no account was given in the State Survey volumes, or in any other American book; but, suspecting it of alien derivation, I soon found it to be *Crepis virens*, Linn., one of the most cosmopolitan members of its genus. But Dr. Gray twice mistook this plant for a new species, assigning it two new names, one in each of two distinct genera. It is his *Malacothrix crepoides* (Pac. R. Rep. xii. 49), and *Crepis Cooperi* (Proc. Am. Acad. ix. 214); and it was a friendly fortune which permitted him to make this correction of a humiliating two-fold error with his own pen. Even *Malva parviflora* was by this author new-named *M. obtusa* when first it went to him from California.

I am said to have given the new name *Paronychia pusilla* to an obscure weed of Southern Europe, of which the real name is *Herniaria cinerea*. It is the only instance in which I have honored an old weed with a new name; and as I have worked upon the Californian flora now nearly as many years as Asa Gray did, my record in this respect seems not likely to prove worse than his, to say the least.

Botanical Notes.

A Biological Survey of Indiana.—At the last meeting of the Indiana Academy of Science, at Terre Haute, a Biological Survey was established for the State of Indiana, and a board of Directors appointed to organize the survey and outline the preliminary work ordered by the Academy.

It is the purpose of the Botanical Division during the present year to make such additions and corrections to the published "Catalogue of the Plants of Indiana" as are possible, and to secure definite information regarding the distribution of such rare forms as are there published. Specimens illustrating the distribution or occurrence of any plant within the limits of the State must be deposited with the survey before any notice of their belonging to the State Flora can be published. This will insure the ability to verify in future any fact published by the survey. In sending such material it is desirable that notes on the station, habitat, range and abundance of the plant be noted, together with any other information that will be of value.

In addition to the flowering plants and ferns covered in the above, it is the intention of the Division to commence the study of the distribution of the lower cryptogams, concerning which almost nothing has been published from Indiana. While collections will be made of all forms, special attention will be given at present to the study of (1) Mosses, (2) Hepaticæ, and (3) Parasitic Fungi. Specimens are earnestly desired of all species, even those that are most common, from all portions of the State. It is desirable to state with each species the data indicated above, with particular reference to the habitat. In the case of parasitic fungi, it is necessary to indicate the host, and to include sufficient quantity of the host plant, that doubtful determinations may be verified. The Director has been promised the assistance of specialists in the study of material accumulated. Prof. Lucien M. Underwood is the Director of this Division.

A Monstrous Flower of Cypripedium arictinum.—During the early part of June of the present year, while visiting a newly-discovered locality for the rare *Cypripedium arietinum*, near Mt. Pleasant, Mich., Mr. H. T. Blodgett found a monstrous flower of the species, which he placed at my disposal for study. The flower was not fully expanded when found, but the parts were fully grown and soon unfolded. It was remarkable in having the side petals, which are linear and of a brownish color in the normal flower, transformed into sac-like inflated bodies, closely resembling the lip, but differing from it in being smaller with wider and rounder openings, and in not having the edges rolled in. The coloring of these side petals was like that of the lip, pinkish with lines of deep red. The tip of the lip was pushed in upon itself until it was half inverted, partly filling the cavity of the lip. The lip was also flattened and broadened more than usual. The whole plant was rather small, but not unusually so. The other floral organs were normal. CHARLES A. DAVIS.

ALMA COLLEGE, ALMA, MICH., July, 1893.

Index to Recent Literature Relating to American Botany.

Azolla filiculoides.—On the Development of. Douglas H. Campbell (Ann. Bot. vii. 155–187; three plates).

Azolla.—Some Notes on. Douglas H. Campbell (Zoë, iii. 340–343).

Botanical Notes from Texas.—VIII.–IX. E. N. Plank (Gard. and For. vi. pp. 272; 283).

Mention is made of *Opuntia Engelmanni*, *O. leptocaulis*, *Juglans rupestris*, *Leucophyllum Texanum*, *Condalia obovata*, *Gaillardia pulchella*, *Rubus trivialis* and others.

Alluding to cypress-trees, the author suggests that the so-called cypress-knees are probably only abortive attempts of the species to reproduce itself from its roots. At Lake Charles, La., the knees of some small cypress-trees were observed bearing twigs and leaves.

California Plants.—Notes on: IV. S. B. Parish (Zoë, iii. 352-354).

Remarks on *Calochortus venustus* and *Lilæa subulata.*

Caryopsis.—On the Development of the. Rodney H. True (Bot. Gaz. xviii. 212; with three plates).

Comarum palustre. (Meehan's Month. iii. 97).

With illustration of the Marsh Cinquefoil.

Contribution to the Biology of the Organism causing Leguminous Tubercles. Geo. F. Atkinson (Bot. Gaz. xviii. 226, 257).

Corrections and Additions to Moses Craig's Catalogue of the Uncultivated Flowering Plants Growing on the Ohio State University Grounds. W. A. Kellermann and W. C. Werner (Bull. No. 3 Ohio Agric. Ex. Sta. 1893).

Difference between the common Salt-wort and the Russian Thistle. L. H. Dewey (Bot. Gaz. xviii. 275).

A comparison of the characters of *Salsola Kali*, L. and the var. *Tragus*, D. C.

Dioon pectinatum (Gard. Chron. xiii. 718, illustrated).

Europaeischen Uredineen auf der Hochebene von Quito—Ueber das Vorkommen von. G. von Lagerheim (Bot. Centralbl. liv. 324).

Puccinia coronata and *P. graminis* are recorded as occurring in Ecuador and *Fusarium uredinis* is described as new.

Fertilization—Notes on. Alice J. Merritt (Zoë, iii. 311, 312).

Notes on pollination of *Trichostema lanceolatum* and *Zauschneria Californica.*

Flora of Denver, Colorado—A popular. Alice Eastwood (Zoë Pub. Co., San Francisco, no date).

This little Flora, or more properly cheeklist, enumerates, with short notes, 484 Phænogamous plants growing near Denver.

Flora of Sonora—Notes concerning the. T. S. Brandegee (Zoë, iii. 344–349).

Flowers and Insects—XI. Charles Robertson (Bot. Gaz. xviii. 267–274).

Notes on the insects observed visiting *Stellaria media*, *Malva rotundifolia*, *Abutilon Avicennæ*, *Hibiscus lasiocarpus*, *H. Trionum*, *Geranium Carolinianum*, *Oxalis violacea* and *Melilotus alba.*

Fungi—New Californian. J. B. Ellis and B. M. Everhart (Erythea, i. 145–147).

Descriptions of new species in the genera *Dimerosporium*, *Metasphæria*, *Eutypella*, *Pseudovalsa*, *Phyllosticta* and *Cercospora.*

General Notes of a Trip through Southeastern Utah. Alice Eastwood (Zoë, iii. 354–361).

Grasses of the Pacific Slope, including Alaska and the Adjacent Islands. Part II. Geo. Vasey (U. S. Dept. Agric., Div. of Botany, Bull. No. 13, pp. 50, 50 plates).

The second part of this beautifully illustrated work consists of plates and descriptions of the following grasses: *Agropyrum divergens*, *Agrostis foliosa*, *A. microphylla*, *Arctagrostis latifolia*, *Atropis Lemmoni*, *Bromus Orcuttianus*, *B. Suksdorfii*, *Calamagrostis*

arctica, C. neglecta, C. sylvestris, var. *longifolia, Coleanthus subtilis, Colpodium pendulinum, Danthonia Californica, Deschampsia elongata, D. holciformis, Dupontia Fischeri, D. psilosantha*, var. *flavescens, Elymus arenarius, E. condensatus, E. triticoides, Festuca microstachys, F. subulata, F. viridula, Glyceria pauciflora, Hystrix Californica, Melica bromoides, M. bulbosa, M. frutescens, M. fugax, M. Harfordi, M. stricta, Phippsia algida, Pleuropogon Californicum, P. refractum, Poa arctica, P. argentea, P. Bolanderi, P. Californica, P. confinis, P. Douglasii, P. glumaris, P. Howellii, P. Kelloggii, P. macrantha, P. nervosa, P. pulchella*, var. *major, P. purpurascens, P. Thurberiana, P. unilateralis, Trisetum barbatum* and *Uniola Palmeri.* The descriptions are mainly drawn up by Mr. L. H. Dewey.

Gloiocephala epiphylla. Geo. Massee (Grevillea, xxi. 33, 34, illustrated).

A new genus and species from Jamaica.

Hieracium Pilosella (Gard. and For. vi. 290).

The record of this little European species found by Miss Mary Hunnewell growing spontaneously on roadsides at Wellesley, Mass.

Index Hepaticarum, Part I.—Bibliography. Lucien Marcus Underwood. (Mem. Torr. Bot. Club, iv. pp. 1–91, June, 1893).

This is the first of a series of three papers, the second of which is to be an index to all the species described, with a reference to each to the genera recognized at the present time; and the third a classified arrangement of the species to show our present knowledge of their geographic distribution. Besides the 84 pages of authors and titles in the first part, there is a synoptic index to the bibliography, in which Germany leads the list in the number of systematic papers. It is hoped that the further parts will not be long delayed.

Key to Kansas Trees in their Winter Condition. A. S. Hitchcock (Eighth Bien. Rep. Kan. St. Bd. Agr. 1893).

Mamillaria Notesteinii. F. N. Notestein (Zoë, iii. 349).

An emendment and enlargement of Dr. Britton's description of this species, drawn from new material.

Mariposa County as a Botanical District—IV. J. W. Congdon (Zoë, iii. 314–325).

This part of Mr. Congdon's paper deals with the subalpine region, and enumerates 295 species inhabiting it.

Mentzelia affinis as a Field Weed. Edward L. Greene (Erythea, i. 158).

Museœ.—A Synopsis of the Genera and Species of. J. G. Baker (Ann. Bot. vii. 189–222).

This is a very important contribution to our knowledge of the Banana Family. The genera are *Heliconia* with 29 species, all of Tropical America, *H. platystachys* of the West Indes and Guatemala being described as new, *Strelitzia* with 4 species, all of Cape Colony, *Ravenala* with 2 species, one Madagascan, the other of Northern South America, and *Musa*, with 32 species, all of the Old World. The banana, *M. Sapientium* in its wild seed-bearing form (*M. seminifera*, Lour.), Mr. Baker concludes probably extends from Behar and the Eastern Himalayas to the Philippine and Malay Archipelagos. N. L. B.

North American Sileneœ and Polycarpœ.—The. B. L. Robinson (Proc. Amer. Acad. Arts and Sci., xxviii. 124–155, reprint; Contrib. Gray Herb., New Series, No. V.).

This is a treatment of the genera and species of these tribes of the Caryophyllaceæ, preliminary to their description in the continuation of Dr. Asa Gray's Synoptical Flora of North America. It includes *Dianthus* with 5 species, *Gysophila* with 2, *Tunica* with 1, *Saponaria* with 2, *Silene* with 50, two of them described as new, *Lychnis* with 15, *L. Taylorœ* being a new one from Arctic America. *Agrostemma* with 1, *Drymaria* with 5, *Polycarpon* with 2, *Lœflingia* with 3 and *Stipulicida* with 1 species. The arrangement and method of the paper is much the same as that followed by Dr. Gray in a similar work. The citation of genera is carried back to the first edition of Linnæus' Genera Plantarum (1737) in opposition to the agreements reached at Rochester and Genoa, where the first edition of the Species Plantarum (1753) was decided upon as best. The original authors of species are not cited in parenthesis, which is also contrary to the Rochester code. We append a few notes on the plants described by Dr. Robinson.

Dianthus prolifer, L., has been found as far west as Cleveland, Ohio (H. C. Beardslee, 1891). *Dianthus Armeria*, L., Lynchburg, Marion and Eggleston's Springs, Va.; *Tunica Saxifraga* (L.) Scop., Flushing, Long Island (Schrenk, 1879); *Gypsophila muralis*, L., Staten Island, Deerfield, Mass. (Miss L. R. Heller, 1886); Elmwood, R. I. (J. F. Collins, 1890–92). *Silene Gallica*, L. Sp. Pl. 417, stands on the page of that work after the one where *S. Anglica* is published; *Silene Cucubalus*, Wibel (1799), was first published by Linnæus as *Cucubalus Behen* in 1753, but there is a *Silene Behen*, also of Linnæus; it was next published as *Behen vulgaris* by Mœnch (Meth. 709, 1794), and should be cited *S. vulgaris* (Mœnch) Garcke, Fl. Deutsch, Ed. 9, 64 (1869); the plant is exceedingly abundant in Northern New Jersey, and extends to Tennessee (Scribner, 1890); the name *Silene alba*, Muhl. Cat. 45 (1813), known to apply to *Cucubalus niveus*, Nutt. (1818), is rejected as "seminudum;" from this we infer that Dr. Robinson would reject all the names in Muhlenberg's Catologue, for this is as well identified as any of them; in this view a large number of familiar names would have to be abandoned; *Silene stellata* (L.) Ait., extends to North Carolina (Small, 1892, Heller, 1890); *Silene nutans*, L., is an addition to our adventive flora, found on Mt. Desert; *Silene Pennsylvanica*, Michx. (1803), is antedated by *S. Caroliniana*, Walt. (1788), and the plants are the same (vid. BULLETIN xviii. 268); *Silene Menziesii*, Hook., and *S. Scouleri*, extend eastward to Nebraska (Williams, 1890, Webber, 1889); *Lœflingia Texana*, Hook., extends to Nebraska (Webber, 1889).

Silene incompta, Gray, is reduced *S. Bridgesii*, Rohrb., *S. plicata*, Wats., to *S. Thurberi*, Wats., *Lychnis Californica*, Wats., becomes *S. Watsoni*, Robinson, *S. Macounii* and *S. monantha*, Wats., are referred to *S. Douglasii* as varieties. N. L. B.

Notholæna tenera.—A new Station for. S. B. Parish (Erythea, i. 153–154).

Novitates occidentales.—IV. Edward L. Greene (Erythea, i. 147–153).

Descriptions of new species in the genera *Streptanthus*, *Cardamine*, *Sidalcea*, *Ceanothus*, *Eriophyllum*, *Erigeron*, *Eupatorium*, *Apocynum*, *Asclepias*, *Muilla*, *Calochortus* and *Fritillaria*.

Preliminary Contribution to Our Knowledge of the Cretaceous Formation on Long Island and Eastward. Arthur Hollick (Trans. N. Y. Acad. Sci. xii. 222–237, Pl. V.–VII.).

This paper follows a previous one by the same author on "Plant Distribution as a Factor in the Interpretation of Geological Phenomena, with Special Reference to Long Island and Vicinity," and may be considered as a demonstration of some of the points which were previously merely surmised as probable.

An historical sketch and bibliography of early researches in the cretaceous of Eastern North America is given, after which the author gives the results of his personal investigations of the plant remains found on the north shore of Long Island, notably in the vicinity of Glen Cove. The results obtained prove the existence there of cretaceous strata beyond doubt, and give indications of their former existence at other points along the north shore of the Island. The author is able to identify many of the fossil leaves with those previously found in the cretaceous of New Jersey, Staten Island and Martha's Vineyard.

The following are figured: *Liriodendron simplex*, Newb.; *Laurus Plutonia*, Heer; *Myrtophyllum* (*Eucalyptus ?*) *Geinitzi*, Heer; *Sapindus Morrisoni*, Lesq.; *Dalbergia Rinkiana*, Heer.; *Magnolia Capellini*, Heer.; *M. speciosa*, Heer.; *Sassafras* (*Araliopsis*) *acutilobum*, Lesq., and *Diospyros primæva*, Heer. N. L. B.

Plant Distribution as a Factor in the Interpretation of Geological Phenomena, with Special Reference to Long Island and Vicinity. Arthur Hollick (Trans. N. Y. Acad. Sci., xii. 189–202).

The author discusses the occurrence of the pine barren flora on Staten Island, Long Island, Nantucket and in Southeastern New England, and endeavors to reason how it came to the latter region. As no trace of it is to be found on the mainland between New Jersey and Rhode Island, the conclusion is reached that it must have spread from Long Island. It is at this point that the geological part of the discussion enters, and from the conditions now existing it is inferred that the land connection must have existed between Long Island and Southeastern New England in recent geological times, thus affording a land area over which the flora migrated from the southward on the retreat of the continental glacier. N. L. B.

Quercus densiflora—Extended Range of. Barclay Hazard (Erythea, i. 159, 160).

Remarks on the Genoa Congress. Otto Kuntze (Erythea, i. 155–157).

Report of Botanical Section. (Proc. Rochester Acad. Sci. ii. 176.)

Among other interesting items, *Rhododendron maximum* is reported from Penfield, N. Y., a station north of its usual habitat.

Report of the Botanist—Seventh Annual. Charles E. Bessey (Nebraska Sta. Bd. Agric., 1893).

Notes on and illustrations of the weeds of Nebraska. A preliminary description of the native and introduced grasses of Nebraska enumerates 154 species, many of them also illustrated.

Rudbeckia hirta—Variation in Ray-flowers in. Florence Beckwith (Proc. Rochester Acad. Sci. ii. 170, illustrated).

Saprolegniaceæ of the United States with Notes on other Species.—J. E. Humphrey (Trans. Amer. Phil. Soc. Reprint.)

This monograph of eighty-four pages and seven full quarto plates is a valuable contribution to the previously very limited knowledge of an obscure but very interesting, important and peculiar group of Fungi. The subjects of non-sexual reproduction and sexual reproduction receive full treatment, the various points being brought out with the aid of superior lithographs of the stuctures studied. Following the chapter upon occurrence and distribution of the Saprolegniaceæ is the systematic portion. There is a key to the genera, and under each genus a key to the species. Eleven species, for example, are given of *Saprolegnia*; *S. Treleaseana* being new; fifteen of *Achlya*, with the following described for the first time: *A. Americana*, *A. megasperma* and *A. papillosa*. A full bibliography concludes the work. B. D. H.

Sedum radiatum—Note on. Thomas Howell (Erythea, i. 144).

Senecio aureus—The Embryo-sac and Embryo of. D. M. Mottier (Bot. Gaz. xxiii. 245–253; three plates).

Shrubs of Northeastern America. Charles S. Newhall (G. P. Putnam's Sons, New York, 1893, 8vo, 249 pages, illustrated).

This is the second of the series planned by the author, for presenting in a popular way handbooks of our native woody plants. The first treated of the trees, and the third is to present the vines.

In all the volumes the illustrations are by the author, and though imperfect and suggestive rather than accurate, yet they will undoubtedly be helpful, and add to the attractiveness of the book. We regret that justice has not been done to several of our most attractive shrubs, such as the Laurels. All the drawings are natural size, however, and occupy full pages. The text has broad margins and large type. Besides the descriptions of each species, historical and economic notes occur here and there. Three guides or keys will enable the beginner to analyze any shrub by leaf, fruit or flower, and a chapter explanatory of the terms is also given. The author also advocates in his preface the planting of native shrubs, advice which will be heartily endorsed by all lovers of our beautiful wild tangles and copses; but the list given as worthy of cultivation seems meagre and lacking in some of the most ornamental. E. G. B.

Stomata and Palisade Cells of Leaves. F. C. Stewart (Proc. Iowa Acad. Sci., 1892, 80–84.

Symbiosis and Mutualism in Lichens. Roscoe Pound (Am. Nat. xxvii. 509).

Trematocarpus—The Genus. A. Zahlbruckner and W. B. Hemsley (Ann. Bot. vii. 289, 290).

This is an interesting discussion of the nature of certain orifices in the capsule-wall of *Lobelia macrostachys*, H. and A., on which plant Dr. Zahlbruckner founded his genus *Trematocarpus*. In alluding to the proposed genus in a former number of "Annals of Botany," Mr. Hemsley maintained that the orifices, taken by Dr. Zahlbruckner as pores of dehiscence, were actually the work of insects. Dr. Zahlbruckner now defends his original position, but Mr. Hemsley still maintains the opinion that the pores are not normal, and Dr. Stapf is to investigate the anatomy of the capsule. The further developments of the investigations are awaited with interest. N. L. B.

Trichomanes Petersii. (Meehan's Month. iii. 81, with colored illustration.)

Tsuga Pattoniana (Gardn. Chron. xiii. 659, with figure).

Two New Plants from Washington. B. L. Robinson and H. E. Seaton. (Bot. Gaz. xviii. 237).

Allium Hendersoni and *Calochortus ciliatus* are described as new.

Undescribed Plants from Guatemala. John Donnell Smith. (Bot. Gaz. xviii. 197, with 3 plates). Species of *Capparis*, *Xylosma*, *Stigmatophyllon*, *Oxalis*, *Wimmeria*, *Rubus*, *Mallostoma*, *Hoffmannia*, *Guettarda*, *Parathesis*, *Ardisia*, *Tabernæmontana*, *Philibertia*, *Asclepias*, *Dictyanthus*, *Fimbristemma*, *Utricularia*, *Adenocalymna* (?), *Aphelandra*, *Tradescantia* and *Tinantia* are described as new.

Uredineæ and Ustilagineæ.—Description of new Species of—I. P. Dietel (Bot. Gaz. xviii. 253–256).

Description of new species in the genera *Ustilago*, *Puccinia* and *Uredo*.

Utricularia longifolia. (Gard. Chron. xiii. 718). With illustration of the above species, a native of British Guiana.

Variety of the Western Sumach—On a. W. L. Jepson (Erythea i. 40). Description of *Rhus trilobata*, Nutt. var. *quinata*, n. var.

Views of a working Botanist on the new American Rules of Nomenclature. J. W. Congdon (Zoë, iii. 339).

Weed Seeds found in Clover Seed—A Key for the Identification of. F. C. Stewart (Proc. Iowa Acad. Sci., 1892, 84–90, illustrated).

Yucca Insects and Yucca Pollination—Further Notes on. C. V. Riley (Proc. Biol. Soc. Wash., viii. 42), with illustration of *Yucca Whipplei.*

Zoospores in Spirogyra condensata. L. B. Bridgman (Erythea, i. 128).

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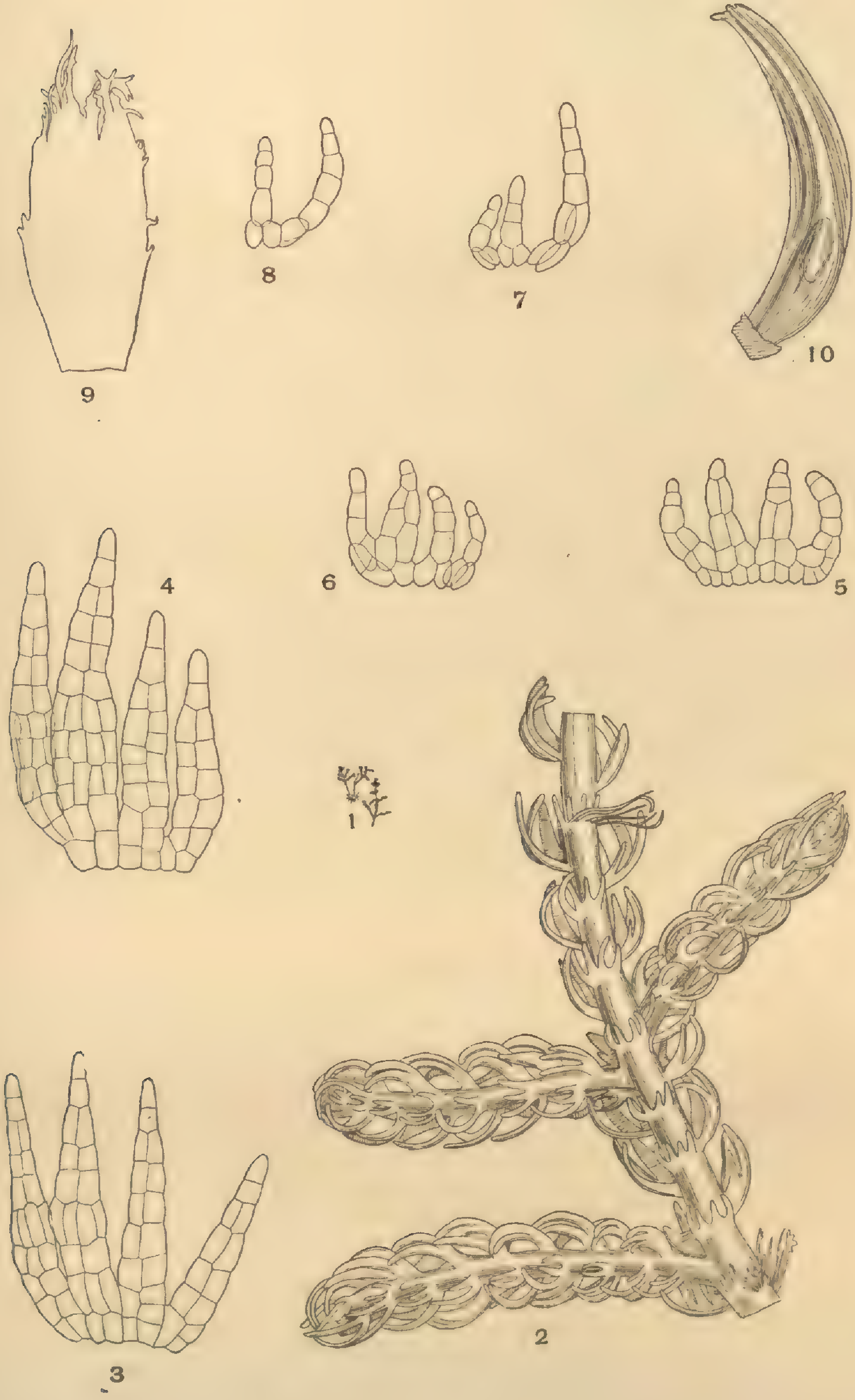
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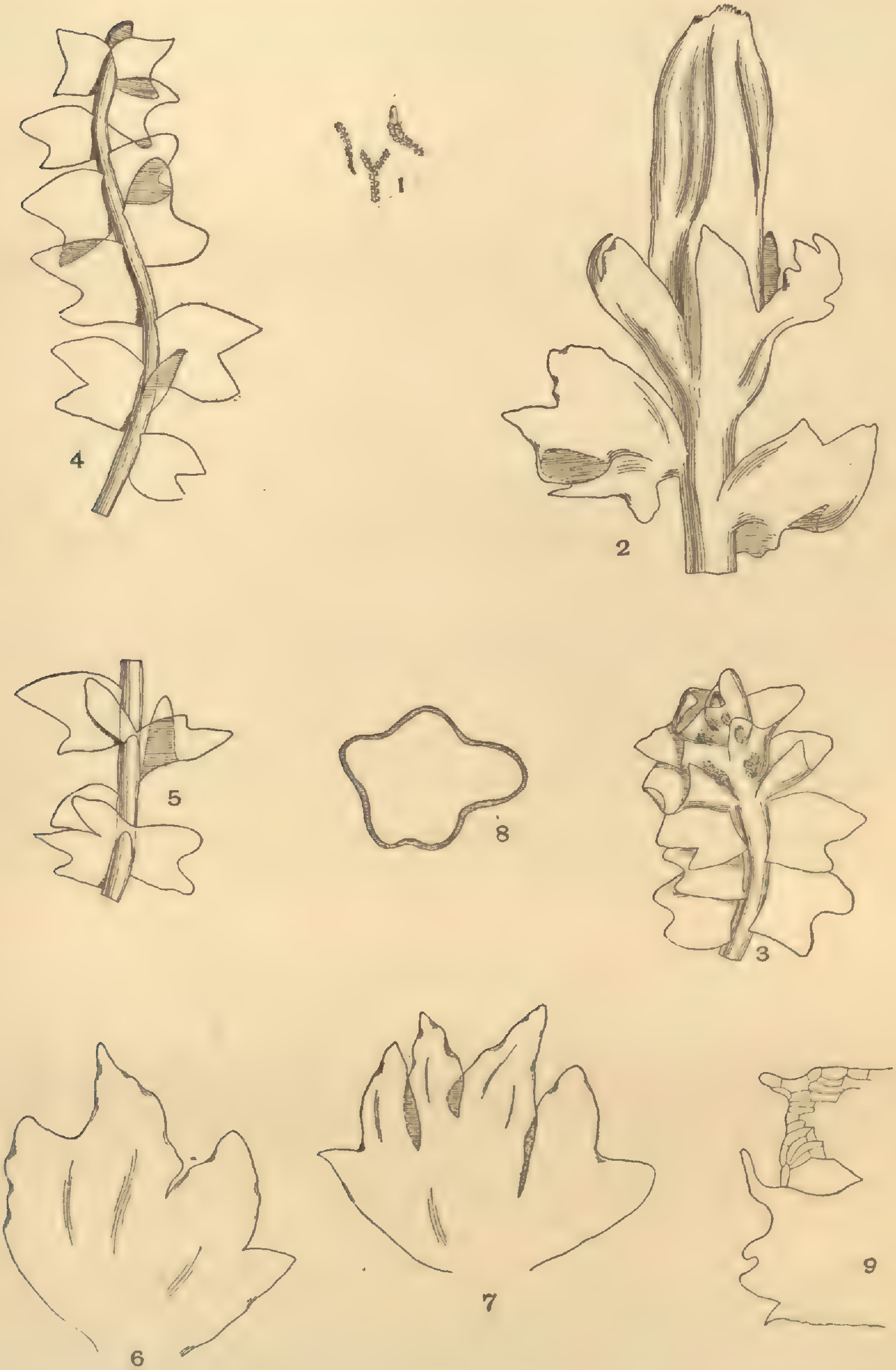

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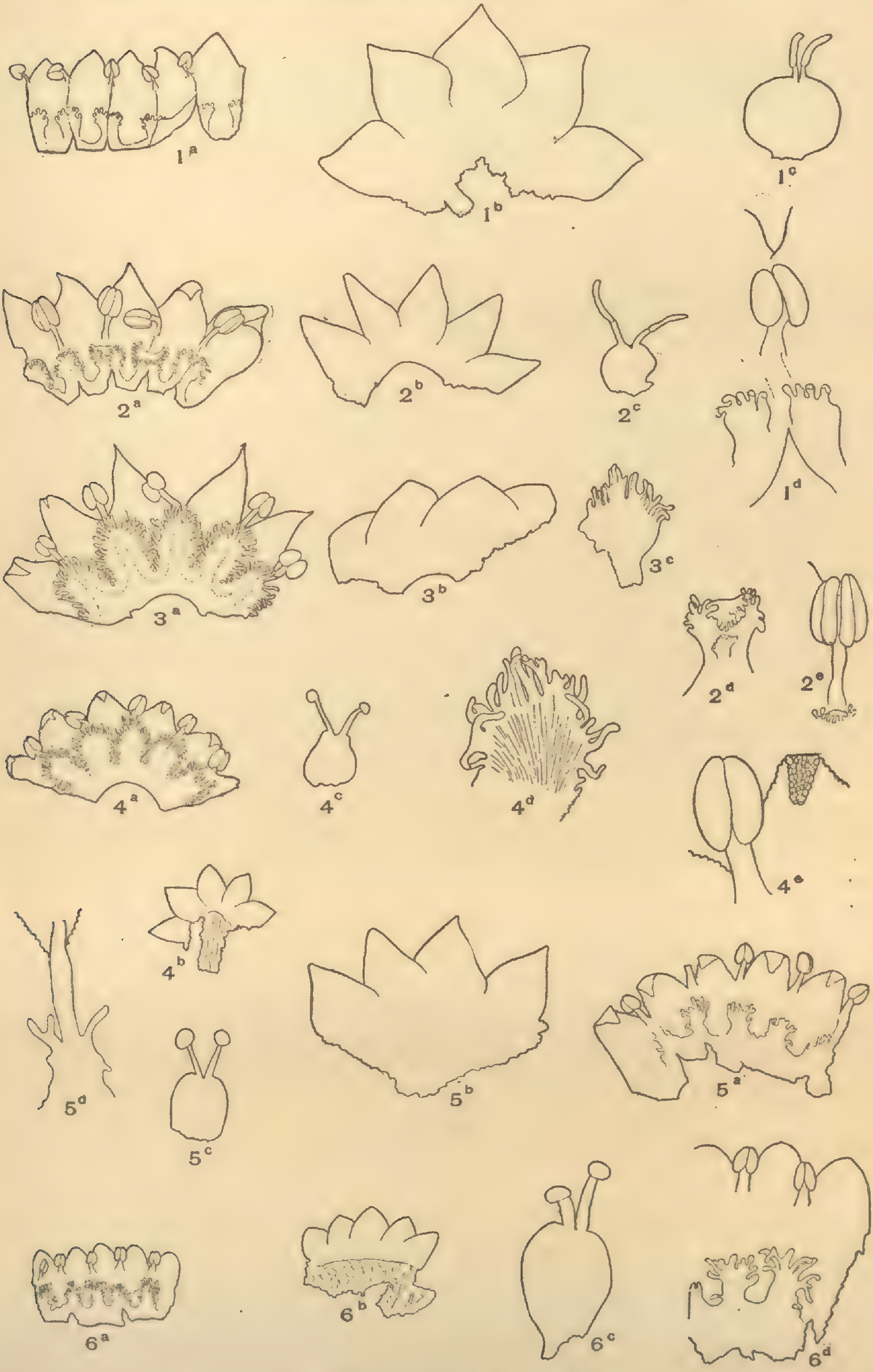
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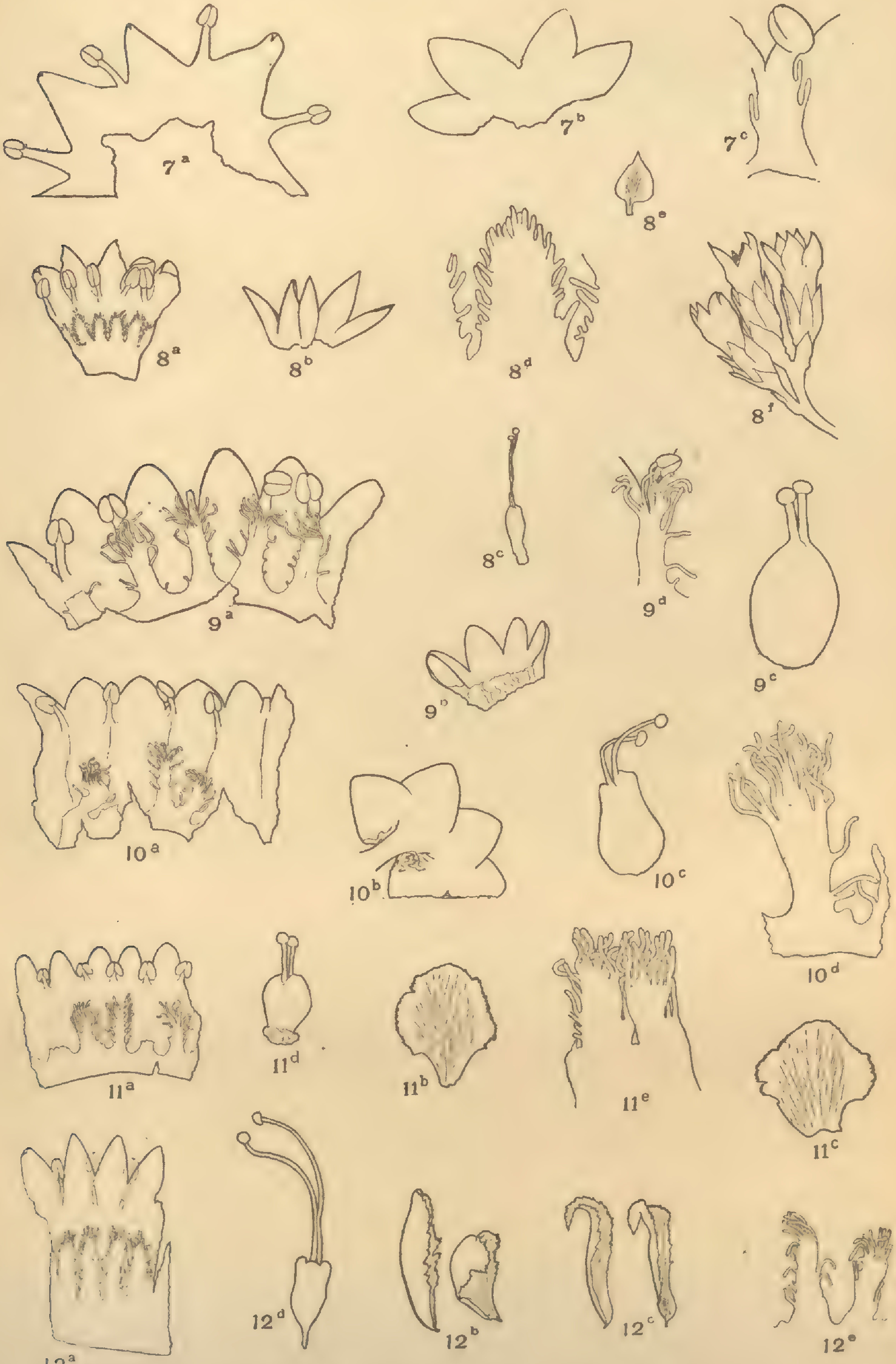
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Vol. XX. SEPTEMBER, 1893. No. 9.

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A MONTHLY JOURNAL OF BOTANY.

EDITED BY

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., September 15, 1893. No. 9.

Lichens of the Black Hills and their Distribution.*

By Thomas A. Williams.

The thoughts presented in this paper are based upon a short study of the specimens in three collections from the Black Hills of South Dakota. The first of these was made by Dr. C. E. Bessey in the summer of 1891 at Custer City; the second by myself in August of the same year in the region surrounding Rapid City; and the third by P. A. Rydberg during the summer of 1892 mainly at and near Custer City.

One of the first points brought out by a study of the lichen flora of the Black Hills is that the number of rock lichens is, comparatively, very large, while tree-loving species are very scarce. Of the 83 species and varieties determined, 44, or more than 53 per cent., have so far been found on rocks only; 22, or nearly 27 per cent., grow on earth, while but 8, or less than 10 per cent., are found growing on trees exclusively. Six forms occur on both trees and rocks, one on both earth and rocks, one on both earth and rotten logs, and one parasitic on the thallus of various Cladoniæ.

Comparing this with a list of lichens found in Eastern Nebraska, the difference is at once seen to be quite striking. In this latter list, which consists of 115 species and varieties, 32, or nearly 28 per cent., grow on rocks; 68, or nearly 58 per cent., grow on trees; 13, or a little more than 9 per cent., are found growing on earth, and two species are parasitic. On the other hand, if we compare the Black Hills list with one by Henry Willey, based upon collections made in the Rocky Mountains by Dr. Coulter, found in the report of the latter in the United States Geological Survey of the Territories, we find a greater similarity, so far as distribution is concerned. In this case 34, or about 52 per cent., were collected on rocks; 18, or nearly 28 per cent., on earth; 12, or more than 18 per cent., on trees, and a single species on both trees and rocks. These numbers may be readily followed out in the appended table:

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* Read before the Section of Botany, A. A. A. S., Madison Meeting, August, 1893.

	NUMBERS.			PER CENTS.		
HABITAT.	Black Hills.	Eastern Nebr.	Rocky Mts.	Black Hills.	Eastern Nebr.	Rocky Mts.
On trees,	8	68	12	10	58	18
On rocks,	44	32	34	53	28	52
On trees and rocks,	6	. . .	1	. . .	. . .	. . .
On earth,	22	13	18	27	9	28
On earth and rocks,	1	. . .	. . .	. . .	. . .	. . .
On earth and wood,	1	. . .	. . .	. . .	. . .	. . .
Parasitic,	1	2	. . .	. . .	. . .	. . .
Totals,	83	115	65			

Twenty-five of the lichens found in the Black Hills are found also in Eastern Nebraska and 20 are found in the Rocky Mountains, while the Rocky Mountain list contains 16 species found in Eastern Nebraska. Nine forms are common to the three regions.

It would seem from this that the proportion of species common to the Black Hills and Eastern Nebraska and to the former locality and the Rocky Mountains is nearly the same when the numbers in all the lists are considered. From undetermined material on hand, however, it is very evident that when thoroughly worked up, the lichen flora of the Black Hills will show a great many more species found also in the Rocky Mountains.*

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* Most of the specimens examined have come from the eastern side of the Hills, and we may expect more Rocky Mountain forms from the western side, for reasons given later.

Of the 25 lichens common to Eastern Nebraska and the Black Hills, 10 are found on rocks, 5 on earth and 4 on trees. Of the 20 common to the Black Hills and Rocky Mountains, 11 grow on rocks, 5 on soil and but 3 on trees.

The 83 species and varieties found in the Black Hills belong to 22 genera, the three largest being *Lecanora* with 16 representatives, *Placodium* with 10, and *Cladonia* with 7, though *Lecidea*, in the Tuckermanian sense, when well worked over will probably give nearly or quite as many species as *Lecanora*. The lichens of the Rocky Mountain list are distributed among 17 genera, the three largest being *Lecanora* with 17 species and varieties, *Placodium* with 10 and *Lecidea* with 8.

Fourteen of the 17 genera are also found in the Black Hills and 13 in Eastern Nebraska, 12 of these being common to all three regions. The Nebraska list includes 31 genera.

Turning now to the distribution given by Tuckerman* to the species found in the Black Hills, and 45 are found to be general throughout the United States, 24 are Alpine or sub-Alpine, 6 are peculiar to the Pacific Coast, 3 to the Atlantic Coast, 3 to the great plains, and one a local form of a widely distributed species. One species, *Rinodina mamillana*, Tuckerm., has only been reported from the Sandwich Islands and the Galapagos Islands. Again, 43 of the species have been reported from Arctic America, while but 26 have been found in the Southern States, and 10 of the 26 are found only in the mountains, leaving but 16 that can really be said to belong to the South, and these are all included in those species whose distribution is said to be general throughout the United States. Sixty-two species are found in Europe, being either Alpine, sub-Alpine or confined to the North of of Europe. Seven species are peculiar to the United States.

A comparison of the Black Hills list with Tuckerman's Lichens of California, Oregon and the Rocky Mountains, shows that 24 of the species occur on the coast, while 30 are found in the Rocky Mountains, the 30 including nearly every one of the 24 reported from the coast. From this list and the one by Mr. Willey it may be seen that in all 34 species of the Black Hills list have been found in the Rocky Mountains.

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*Synopsis North American Lichens, Parts I. and II.

From the foregoing the following facts may be gleaned:

1. In the lichen flora of the Black Hills the rock lichens greatly predominate and have a more general distribution, the earth forms coming next.

2. This lichen flora is essentially northern in character.

3. It is more closely allied to the flora of the Rocky Mountains than to that of Eastern Nebraska and Dakota and hence, of course, to that of the Mississippi Valley.

4. That though intermediate between the lichen flora of the Rocky Mountains and that of the Mississippi Valley, it is not so distinctly so as the geographical position of the Black Hills region might lead us to expect.

The explanation of these conclusions can be found, undoubtedly, in the climate and geological make-up and history of the Black Hills region. The wide stretch of prairie, with its hot dry winds, lying between the Black Hills and the Lower Missouri Valley, as well as the Mississippi Valley proper, is not favorable to the development and growth of tree-loving species, even when plenty of trees are to be found. On the other hand, saxicoline and terricoline species survive because better protected and more likely to get enough moisture to retain life even in times of excessive drought. This condition of things would break the connection between the Black Hills and Mississippi Valley floras, and would tend to prohibit an interchange of forms except those few earth and rock forms able to exist.

East and south of the Black Hills lies the famous Bad Land region of South Dakota and Nebraska. This region is subject to hot, dry winds, mainly from the south or southeast, which strike the Black Hills on the east and south. As a result tree lichens are scarce in this part of the Hills, becoming more and more plentiful as we go farther into the heart of the region. The larger part of the tree lichens in the collections examined came from the cañons and gulches well up in the Hills. Rock lichens, particularly species of *Placodium*, *Lecanora* and *Rinodina*, are common all along the eastern edge of the Hills, as well as in the foot hills bordering them.

Geologically, the Black Hills are largely composed of various kinds of sandstone, limestone and granite, all of which furnish substrata very favorable to lichen growth. This is particularly true of the sandstones, which usually furnish the greatest variety of forms, as well as quantity of individual species. Furthermore, the Black Hills are very old, geologically speaking, and once covered a much greater area than at the present time, with probably closer connections with the Rocky Mountains. Alpine and northern forms common to these regions very likely came in with the same influx of species that sprinkled the mountain tops of both sides of our continent with closely allied forms.

List of Species and Varieties.

Ramalina pollinaria, Ach. Rocks. Custer City (Bessey.)

Usnea barbata (L.) Fr. var. ——? always infertile. Trees. Custer City (Rydberg, Bessey); Rapid City.

Alectoria jubata (L) Fr. var. *implexa*, Fr. Trees Custer City (Bessey).

Theloschistes polycarpus (Ehrh.) Tuckerm. Trees, Rapid City.

Parmelia olivacea (L.) Ach. Common on trees, Custer City (Rydberg); Rapid City.

Parmelia olivacea (L.) Ach. var. *panniformis*, Nyl. Rocks, Custer City (Bessey).

Parmelia caperata (L.) Ach. Common on trees and rocks. Mostly infertile, except on the latter substrate. Custer City (Rydberg); Rapid City.

Parmelia conspersa (Ehrh.) Ach. Common on stones. Custer City (Bessey); Rapid City.

Parmelia molliuscula, Ach. High, dry and sterile soil near Rapid City. Also common in the Bad Lands of Nebraska and the Dakotas.

Physcia pulverulenta (Schreb.) Nyl. Trees. Rapid City.

Physcia pulverulenta (Schreb.) Nyl. var. *muscigena* (Whlnb.) Schær. On earth among moss at bases of trees. Custer City (Bessey).

Physcia stellaris (L.) Tuckerm. Trees and rocks. Rapid City.

Umbilicaria rugifera, Nyl (?). Rocks. Rapid City.

Umbilicaria cylindrica (L.) Delis. Plentiful on rocks. Custer City (Rydberg); Rapid City.

Umbilicaria Muhlenbergii (Ach.) Tuckerm., var. *alpina*, Tuckerm. Rocks. Rapid City; Custer City (Bessey).

Umbilicaria vellea (L.) Nyl. Rocks. Rapid City.

Umbilicaria pustulata (L.) Hoffm. Rocks. Custer City (Bessey).

Sticta amplissima (Scop.) Mass. Trunks of trees and rocks. Custer City (Bessey); Rapid City.

Peltigera aphthosa (L.) Hoffm. Earth among moss. Custer City (Rydberg); Rapid City.

Peltigera horizontalis (L.) Hoffm. Earth, etc. Custer City (Bessey); Rapid City.

Peltigera rufescens (Neck.) Hoffm. Earth, etc. Custer City (Bessey); Rapid City.

Peltigera canina (L.) Hoffm. Earth, etc. Custer City (Bessey); Rapid City.

Peltigera canina (L.) Hoffm., var. *spongiosa*, Tuckerm. Earth among moss in deep cañons above Rapid City.

Peltigera canina (L.), Hoffm., var. *membranacea*, Ach. Earth, etc. Rapid City.

Solorina saccata (L.) Ach. Moist earth among moss on rocks in deep cañons. Plentiful. Rapid City.

Pannaria nigra (Huds.) Nyl. Common on rocks, particularly limestone. Rapid City.

Collema pulposum (Bernh.) Nyl. (?) Moist earth. Rapid City.

Leptogium lacerum (Sw.) Fr. Among moss. Rapid City.

Leptogium dactylinum, Tuckerm. Rocks. Custer City (Bessey); Rapid City.

Leptogium pulchellum (Ach.) Nyl. (?) Rocks and among moss. Rapid City.

Placodium elegans (Link) DC. Plentiful on rocks. Custer City (Rydberg, Bessey); Rapid City.

Placodium murorum (Hoffm.) DC., var. *miniatum*, Tuckerm. Rocks. Custer City (Bessey); Rapid City.

Placodium cirrochroum (Ach.) Hepp. This beautiful species occurs plentifully on rocks at Rapid City, but is always sterile.

Placodium fulgens (Sw.) DC. Sterile and calcareous soils. Rapid City. Not rare, but not nearly so plentiful as in the Bad Lands.

Placodium fulgens (Sw.) DC., var. *bracteatum*, Ach. With the species.

Placodium mycrophyllinum, Tuckerm. Dead wood and bark of trees, Custer City (Rydberg); Rapid City. A common species.

Placodium citrinum (Hoffm.) Leight. Very plentiful on rocks. Custer City (Bessey); Rapid City.

Placodium ferrugineum (Huds.) Hepp., var. *Bolanderi*, Tuckerm. Rocks. Custer City (Bessey), rare.

Placodium vitellinum (Ehrh.) Næg. and Hepp. Rocks. Custer City (Bessey); Rapid City. Not uncommon.

Lecanora rubina (Vill.) Ach. Rocks. Custer City (Bessey, Rydberg); Rapid City. Very common.

Lecanora rubina (Vill.) Ach., var. *opaca*, Ach. With the species.

Lecanora muralis (Schreb.) Schær. Rocks. Rapid City.

Lecanora muralis (Schreb.) Schær., var. *saxicola*, Schær. Rocks. Rapid City. Not uncommon.

Lecanora frustulata (Dicks.) Mass. Rocks. Custer City (Bessey), and what is probably this species at Rapid City.

Lecanora sordida (Pers.) Th. Fr. Rocks. Rapid City.

Lecanora subfusca (L.) Ach. Trees, wood and stone. Rapid City.

Lecanora Haydeni, Ach. Rocks and dead wood. Rapid City. Not uncommon and very variable.

Lecanora melanaspis (Wahl.) Ach. Rocks. Rapid City, and what seems to be the same thing at Custer City (Bessey). Rare.

Lecanora cinerea (L.) Sommerf. Rocks. Custer City (Bessey); Rapid City. Common.

Lecanora calcarea (L.) Sommerf. Rocks. Rapid City.

Lecanora chlorophana (Wahl.) Ach. Rocks. Rapid City.

Lecanora xanthophana, Nyl. Rocks. Rapid City. Common.

Lecanora xanthophana, Nyl., var. *dealbata*, Tuckerm. Rocks. Rapid City. Often occurs with the species.

Lecanora glaucocarpa (Wahl.) Ach. Rocks. Rapid City. Common.

Lecanora fuscata (Schrad.) Th. Fr. Rocks. Custer City (Bessey); Rapid City Very common.

Rinodina oreina (Ach.) Mass. Rocks. Custer City (Bessey); Rapid City. A very common species.

Rinodina mamillana, Tuckerm. Rocks. Custer City (Bessey). A single specimen, evidently this Sandwich Island species.

Urceolaria scruposa (L.) Nyl. Earth and rocks. Rapid City. Exceedingly common.

Urceolaria scruposa (L.) Nyl. var. *gypsacea*, Nyl. Calcareous earth near Rapid City. It occurs in great abundance in the Bad Lands.

Urceolaria scruposa, var. *parasitica*, Sommerf. On thallus of various species of *Cladonia*. Rapid City, and also common in the Bad Lands.

Cladonia alcicornis (Lightf.) Flœrk. Sandy soils. Rapid City. Not uncommon.

Cladonia cariosa (Ach.) Spreng. Earth. Custer City (Rydberg); Rapid City. Abundant.

Cladonia pyxidata (L.) Fr. Earth, etc. Custer City (Bessey, Rydberg); Rapid City.

Cladonia pyxidata (L). Fr. var. *pocillum*, Ach. Earth. Rapid City. Not uncommon.

Cladonia fimbriata (L.) Fr. var. *tubæformis*, Fr. Earth and rotten logs. Rapid City. Common.

Cladonia gracilis (L.) Nyl. var. *verticillata*, Fr. Earth. Custer City (Rydberg); Rapid City. Not uncommon.

Cladonia macilenta (Ehrh.) Hoffm. Dead wood, etc. Rapid City.

Biatora Russellii, Tuckerman. Rocks and earth. Rapid City. Very plentiful.

Biatora decipiens (Ehrh.) Fr. Calcareous earth. Rapid City.

Biatora coarctata (Sw.) Tuckerm. Rocks. Custer City (Bessey); Rapid City.

Biatora hypnophila (Turn.) Tuckerm. Moss, etc. Rapid City.

Lecidea cæruleo-nigricans (Lightf.) Schær. Earth. Rapid City. Common.

Lecidea tessellata, Flœrk. Rocks. Custer City (Bessey); Rapid City. Common.

Lecidea polycarpa, Fr. Rocks. Rapid City.

Lecidea lapicida, Fr. Rocks. Rapid City (Bessey); Rapid City.

Lecidea enteroleuca, Fr. Trees and rocks. Custer City (Bessey); Rapid City, exceedingly common and variable.

Lecidea Morio, Schær. Rocks. Custer City (Bessey); Rapid City.

Buellia albo-atra (Hoffm.) Th. Fr., var. *saxicola*, Fr. What seems to be this variety on rocks. Rapid City. Rare.

Buellia parasema (Ach.) Th. Fr. Trees. Rapid City.

Buellia coracina (Hoffm.) Th. Fr. Rocks. Custer City (Bessey); Rapid City.

Buellia petræa (Flot.) Tuckerm., var. *Montagnæi* (Flot.) Tuckerm. Rocks. Custer City (Bessey); Rapid City. Common.

Buellia geographica (L.) Tuckerm. Rocks. Custer City (Bessey); Rapid City.

STATE AGRICULTURAL COLLEGE,
BROOKINGS, SOUTH DAKOTA.

Symbiosis in the Roots of the Ophioglossaceæ.*

By Geo. F. Atkinson.

While studying the structure of the root of *Botrychium Virginianum*, yellowish protoplasmic masses in certain cells of the cortical parenchyma, producing a strong contrast with the starch content of the other cells of the cortex, attracted my attention. Close examination and treatment with reagents showed the existence in the cortical parenchyma of the root of a symbiotic fungus stimulating the cells to the development of a rich protoplasmic content.

The organism is located at quite a definite portion of the cortical parenchyma, about one-third to one-half the distance from the epidermis to the central cylinder. In transections of the root it appears in the form of a ring entirely encircling the root, or only occupying an arc of a circle. From this localized center numerous threads extend to the epidermis and the outside of the root.

Since the roots of the Ophioglossaceæ do not possess root-hairs, or only a slight development of them, it occurred to me that possibly the presence of this symbiotic organism was universal in the roots of the order. Accordingly, several species, both of *Botrychium* and *Ophioglossum*, most of them in the Horace Mann herbarium of Cornell University, were examined. In all of them the presence of the fungus was determined.

The species examined, together with the localities, are here appended:

Botrychium matricariæfolium, *B. ternatum* and *B. Virginianum*, from New York.
B. lanceolatum, Massachusetts and Vermont.
B. subbifoliatum, Hawaiian Islands.
B. Lunaria, Clova Mountains.
Botrychium (No. 484, Drummond's Collection, Boston Soc. Nat. Hist.) Louisiana.
Ophioglossum vulgatum, New York and suburbs of Paris.

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* Read before the Section of Botany, A. A. A. S., Madison Meeting, August, 1893.

O. Lusitanicum, Sardinia and Island of Madeira.
O. palmatum, Eastern Cuba.
O. pendulum, Oahu, Hawaiian Islands.

A note accompanies the latter to the effect that it was collected on trees, which is quite strong evidence of the probable necessity for the presence of this symbiont.

It thus appears that in the Ophioglossaceæ throughout the world, there exists a close symbiotic relationship with this organism, in all probability an accompaniment, or the cause of, the absence of root-hairs, which may have disappeared through lack of the necessity for such absorbent organs.

No specimens of *Helminthostachys* were at hand to examine, but I think we may confidently expect to find the organism in this genus also.

It may still be a question how much influence this symbiont has had on the symplicity of structure found in the Ophioglossaceæ, and what effect this would then have on the phylogenetic position of the order.

BOTANICAL DEPARTMENT, CORNELL UNIVERSITY.

Photography as an Instrument for recording the macroscopic Characters of Micro-organisms in artificial Cultures.*

BY GEO. F. ATKINSON.

Many species of micro-organisms in artificial nutrient media present, in the growth of the colonies, characteristic peculiarities of form. These macroscopic appearances are frequently of great value when employed as differential characters. Some species, especially of fungi, when viewed by transmitted light, present important characters in the fine radiating threads and the general arrangement of the colony as a whole. The comparative density also of the colony is frequently quite constant.

A method of accurately recording these macroscopic characters would be a valuable aid in descriptions and comparative study.

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* Read before the Section of Botany, A. A. A. S., Madison Meeting, August, 1893.

Where the growth is colorless, not very dense and peculiar for the fineness of its meshes or radiations, it would be difficult to photograph the colonies by ordinary methods of exposure, since there is little difference in color between the medium and the object.

A sensitive plate in an ordinary camera exposed to a plate culture by perpendicular rays of transmitted light shows little differentiation between the medium and colonies after development. The differentiation is also weak in the ground glass.

When, however, the perpendicular rays of light are cut off, and oblique rays from several directions are thrown through the plate culture upon the sensitive plate, the colonies are differentiated strongly in all their exquisite forms and tracings. The culture plates (Petrie dishes) or tubes, are inserted in an opening in the end of a box, which is painted perfectly black on the inside. Sliding boards, in a grooved frame, each cut to clamp over half the Petrie dish and lined with black velvety stuff hold the plate culture in position. The lens of the camera is pointed toward a window with the plate culture between. A perfectly black screen, 30 cm. to 40 cm. in diameter is then hung upon the window directly in front of the object in order to cut off the perpendicular rays of light.

BOTANICAL DEPARTMENT, CORNELL UNIVERSITY.

Crossing of Cucurbits.*

BY L. H. PAMMEL.

So widespread is the popular belief that several members of the genera *Cucurbita*, *Cucumis* and *Citrullus* will hybridize and "mix," that it is difficult to convince people of these errors. What is more surprising is that these opinions should find support among a certain class of popular scientists. It is scarcely necessary to repeat experiments of this kind, after the diligent work of Naudin, Bailey, Munson and others who have all demonstrated the absurdity of this popular error. In a paper read before the Association of Agricultural Colleges and Experiment Stations, the writer gave the result of a large number of careful hand pollinations made in 1892. These were to the effect that the different species do not "mix." Attention was called to the ease with which crosses could be obtained with nest-egg gourd and other varieties. All of the crosses obtained last year have been cultivated during the present season, and a short report on these may not be amiss.

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* Read by title before the Section of Botany, A. A. A. S., Madison Meeting, August, 1893.

It may be stated with positiveness that none of the seed of numerous varieties of *Cucurbita maxima* show any trace of *C. Pepo* or other cultivated genera. *Citrullus vulgaris* in numerous varieties show no trace of *Cucurbita Pepo*, *Cucumis Melo* and *C. sativus;* nor does *C. sativus* show any trace of *C. Melo* when pollinated by insects.

The different forms of *Cucurbita Pepo* intercross readily; not only was this shown in our hand pollination trials of last year, but our mixed seed has given us few specimens that are true to type.

A few illustrations will suffice.

Common Pumpkin on Long Warted produces a creeping vine less vigorous than Common Pumpkin, with leaf somewhat like the Long Warted. Fruit orange yellow, from four to six inches in diameter, smooth, without any indications of warts.

Vegetable Marrow on Long Warted: A long, slender running vine, something of the type of Vegetable Marrow; fruit golden yellow, or of cream color, elongated, two to four inches in diameter, all of them warted.

Common Pumpkin on Nest-egg Gourd: Leaf and vine of Nest-egg Gourd; color of fruit like Nest-egg Gourd, much elongated and larger than Nest-egg Gourd.

Common Pumpkin on Perfect Gem: Leaf and vine of Perfect Gem; color of fruit creamy yellow, but form and size approaching Pumpkin.

A mixed lot of seeds of Italian Striped show some of the leaf characters of Italian Striped; the stem is fleshy, as in the original, but it is a creeper, not bushy in its habit, as originally. The fruit is short, color orange yellow, and approaches Common Pumpkin.

Proceedings of the Botanical Club, A. A. A. S., Madison Meeting, August 18–22, 1893.

FRIDAY, AUGUST 18.

In the absence of the President, Prof. W. P. Wilson, the meeting was opened by the Vice-President, Prof. W. A. Kellerman.

In the absence of the Secretary, Prof. W. A. McBride, his office was filled by the election of Mr. W. T. Swingle.

The report of the Committee on Nomenclature, appointed at the Rochester meeting of 1892 to prepare a check-list of the flowering and fern plants of Northeastern North America, was made by Prof. N. L. Britton, Chairman. The list was presented nearly complete for printing. Discussion of the report occupied the remainder of the day's session. The report was received, and the following recommendations of the committee were adopted:

1. The amendment of Section III. of the Rochester Code of Nomenclature by striking out all after the word "retained."

This recommendation is based on the mature judgment of the committee, after watching for a year the progress of the demand for a rule which shall admit no exceptions whatever and effect the closest approximation to the immutability of the specific name.

This action authorizes the use of specific names identical with the generic, such as *Catalpa Catalpa*, and preserves the immutability of the specific name, in whatever genus it is first published, even if the same binomial has been published between the time of the first publication of the species and its transfer to the accepted genus, as for example:

SISYMBRIUM PINNATUM (Walt.) Greene, Bull. Cal. Acad. ii. 39 (1887).
  Erysimum pinnatum, Walt. Fl. Car. 174 (1788).
  Sisymbrium canescens, Nutt., Gen. ii. 68 (1818); not *Sisymbrium pinnatum*, Barn. in Gay. Fl. Chil. i. 125 (1845), which is to receive another name.

2. That the general sequence of natural orders as taken up in Engler and Prantl's "Natürliche Pflanzenfamilien" be adopted.

The check-list will therefore begin with the Pteridophyta, followed consecutively by the Gymnospermæ, Monocotylodonæ and Dicotylodonæ.

3. That in determining the name of a genus or species to which two or more names have been given by an author in the same volume or on the same page of a volume, precedence shall decide.

Tissa stands on the same page as *Buda* in Adanson's "Familles des Plantes," but has precedence of a few lines, and is to be adopted.

MONDAY, AUGUST 21.

The report of the Treasurer was received and accepted. It indicated a deficit of $6.16, which was made up by voluntary contributions. Prof. A. S. Hitchcock and Dr. Erwin F. Smith were appointed a committee to nominate officers for the next meeting of the Club.

Discussion of the remainder of the report by the committee on Nomenclature was postponed until Tuesday, and the matter was referred to the committee for reconsideration. It consisted of recommendations relative to the time and method of publication of the list and to the maintenance of the original name in case of plants first published as varieties but subsequently elevated to species, and of plants first published as species but subsequently reduced to varieties.

Mrs. Britton read a paper on "The Genus *Bruchia* in North America," illustrated by specimens and drawings. The paper will be published in a future issue of the BULLETIN.

Mrs. Britton remarked also on the necessity of the examination of types of critical species in the preparation of monographs or other works of reference. Prof. Greene alluded to the method of certification of types and duplicate types adopted by him, by the statement of the place of publication on the labels. Miss Harrison remarked on the identification of types in the National Herbarium.

Prof. Kellerman stated that the original drawings of the plates of Sullivant's "Icones Muscorum," together with many of the specimens used in executing these drawings, had recently been incorporated with the bryological collections of the Ohio State University.

Prof. A. S. Hitchcock exhibited specimens of the recently-described *Ampelopsis quinquefolia*, var. *vitacea*, Knerr., and remarked on the relationship of the plant to the Virginia Creeper. He demonstrated the differences of leaves, tendrils, inflorescences and canes, remarked on the differences in time of blooming, and maintained that they are specifically distinct.

Prof. J. C. Arthur exhibited and described a new centrifugal machine for physiological investigations.

A paper by Mr. D. T. MacDougal, on "The Intertwining of Tendrils," was read by Dr. J. C. Arthur. The plant most studied in this investigation was *Micrampelis lobata.*

Mrs. Britton described the Jæger Moss Herbarium recently acquired by Columbia College. An account of this collection is published in the last number of the BULLETIN.

Prof. Kellerman alluded to the Ohio State Forestry exhibit at Chicago, and stated that *Ilex opaca*, hitherto not certainly known from that State, had been found by him on Sim's Creek, Lawrence county, near the Ohio River; he doubted the occurrence of *Magnolia tripetala* in the State, although it had been reported, and remarked that all the localities given for *Chamæcyparis thyoides* had yielded only *Thuja occidentalis. Polypodium polypodioides* had been found on rocks in Scioto county.

Prof. A. S. Hitchcock described the pollination of *Œnothera Missouriensis.* This plant was in flower in the vicinity of Manhattan, Kansas, between May 23d and June 6th. The flower opens in the latter part of the afternoon, but the stigmas may protrude from the bud as early as 2 p. m. The calyx tube is narrow and about 11 centimeters long, and is as much as half filled with nectar. Just before 8 p. m. the flowers were abundantly visited by a sphinx-moth (*Deilephila lineata*). An individual would support itself above the expanded flower, insert its proboscis, which usually measures about 45 mm., and push its head as far into the throat as possible. Excepting ants, no other insects were observed to visit the flowers, and the visits of the moths ceased at dark. Only the uppermost portion of the nectar is obtained by the insect, but the latter is detained in the flower by its endeavor to secure more. It would seem that the flower was adapted to a moth with a longer proboscis, but none are known to occur in the vicinity except the potato moth.

Prof. Hitchcock also described the pollination of *Pentstemon Cobæa.*

Dr. Erwin F. Smith called attention to the fact that a tumor, not due to nematodes, was becoming increasingly prevalent in the United States on the roots of peaches, almonds and other stone fruits. These tumors vary in size from that of a pea to a man's fist. Nursery stock is especially subject to attack, and the roots of a small tree may often bear half a dozen, nearly the whole energy of the plant being used up by these abnormal growths. The disease occurs from New Jersey to Georgia and west through Michigan and Missouri to Arizona and California. It is now most prevalent on the Pacific Coast, where its depredations are serious and increasing every year. A microscopic examination of the inner tissues of fresh young tumors has not shown the presence of animal or vegetable parasites, and their cause is still a mystery. The most suggestive hypothesis is that they may be caused by external irritation, *i. e.*, to some parasite acting from without. It is a subject becoming economically more and more important, and will soon demand critical study by some plant pathologist.

Prof. D. H. Campbell remarked on a preliminary study of the prothallium in Ophioglossaceæ, and exhibited this organ in *Botrychium Virginianum*.

Prof. Bessey read a paper on "The Use of Personal Names in Designating Species." He strongly condemned the practice. Prof. Britton called attention to the propriety of the use of personal adjectives in genera of a very large number of species, where all the available descriptive adjectives have been exhausted, and also of the valuable historical feature in the association of the first collector's name with a species. Dr. A. B. Seymour approved the position taken by Dr. Bessey. Prof. Coulter favored the use of personal names for the reasons advanced by Dr. Britton and on the ground that they were conducive to stability.

TUESDAY, AUGUST 22.

Prof. J. C. Arthur exhibited and described a new form of registering auxanometer.

Mr. W. T. Swingle read a paper on "The Southernmost Botanical Laboratory of the United States." He described the Subtropical Laboratory of the Division of Vegetable Pathology, United States Department of Agriculture, established at Eustis, Florida. The building has been erected by the citizens of Eustis, is 46 feet long and 34 feet wide and contains six rooms, one of them a visitor's laboratory, which is provided for the use of students not connected with the institution. There is also an experimental garden of one and one-half acres. The Library consists of about 1,000 volumes and 1,000 pamphlets, and all the more important botanical serials are received.

Mr. Swingle also exhibited and described a new Florida palm, related to *Sabal Palmetto* and known as the Etonia palm. He called especial attention to the fact that Florida still contains a large number of new or imperfectly known species of plants.

Prof. Byron D. Halsted described a new species of *Exobasidium*, *E. Peckii*, occurring on *Andromeda Mariana* and causing the enlargement and modification of its flowers. He also showed specimens of *Rhamphospora Nymphecæ*, an Indian fungus now found on water-lily leaves in America, of a *Phyllosticta* following insect depredations and an Ascomycete on *Pistia stratiotes*.

Mrs. Britton remarked on some of the more interesting mosses collected on Saturday's trip to the dells of the Wisconsin River.

Mr. A. B. Seymour read a paper on "The Synonymy of *Valsa stellulata* and its Synonymical Allies."

He also exhibited copies of a dichotomous key to the lichen genus *Cladonia*, arranged by Dr. F. Le Roy Sargent.

A paper by Mr. S. A. Beach, "Some Observations on Black Knot," was read by Dr. B. D. Halsted and discussed by Prof. W. H. Brewer and Prof. H. L. Bolley. The infection was noticed as much worse adjoining a row of old and badly infested plum trees. Proof was also adduced that infection must have taken place a year previous to the appearance of the disease.

The following papers were read by title:

"Sand Dune Weeds," by L. H. Bailey.

"Propagation of *Ranunculus delphinifolius* by Runners," by W. W. Rowlee.

"Some Notes on the Germination of the Spores of *Enteridium Rozeanum*," by Elias J. Durand.

"Herbarium Entomology," by C. V. Riley.

"*Yucca* Pollination," by C. V. Riley.

"Notes on a hexenbesen of *Rubus*," by B. T. Galloway.

"The Falling of Pine Leaves," by B. T. Galloway.

"Some Methods employed in the Investigation of parasitic Fungi and other Organisms," by B. T. Galloway.

The committee appointed at the Rochester meeting to consider and report on the advisability of forming a national botanical society presented a majority report disapproving the formation of such an organization at the present time, and Prof. C. R. Barnes presented a minority report recommending its immediate establishment by the selection by the Club of a committee of ten who shall select fifteen others, these twenty-five to be the charter members of the society. The minority report was accepted, and a committee of ten selected by ballot.

The Committee on Nomenclature was authorized to proceed with the publication of the check-list, matters concerning it not determined by the Club were referred to the committee with power, and the committee increased to nine members by the appointment of Professors Edward L. Greene and Wm. Trelease.

Officers for the next meeting were elected as follows: President, Prof. Douglas H. Campbell; Vice President, Prof. Daniel C. Eaton; Secretary and Treasurer, Mr. W. T. Swingle.

N. L. Britton.

Titles of Papers read before the Section of Botany, A. A. A. S., Madison Meeting, August, 1893.

Photography as an Instrument for recording the microscopic Characters of Micro-organisms in artificial Cultures, by G. F. Atkinson.

Symbiosis in the Roots of Ophioglossaceæ, by G. F. Atkinson.

Observations on a Rust affecting the Leaves of the Jersey or Scrub Pine, by B. T. Galloway.

Prophylla of Gramineæ, by W. J. Beal.

A new injection Needle for the Study of the Lower Plants, by J. Christian Bay.

On the Food of Green Plants, by Charles R. Barnes.

Results of some recent Work on Rust of Wheat, by B. T. Galloway.

Comparative Study of the Structure and Junction of the Sporangia of Ferns in the Dispersion of Spores, by G. F. Atkinson.

The Solandi Printing applied to Botanical Work, by Byron D. Halsted.

Present Aspects of the Nomenclature Question, by N. L. Britton.

Lichens of the Black Hills, by T. A. Williams.

The Bibliography of American Botanical Literature, by J. Christian Bay.

Notes on the Development of *Marattia Douglassii*, by Douglas H. Campbell.

The fructification of *Juniperus*, by John G. Jack.

The Roots of Orchids, by M. B. Thomas.

Preliminary Notes on some Chromogenic Bacteria of the Ames Flora, by L. H. Pammel.

Further Observations on the Fermentation Tube with special Reference to Anærobiosis, Reduction and Gas Production, by Theobald Smith.

Two new and destructive Diseases of Cucurbits, by Erwin F. Smith.

Preliminary Statement concerning Botanical Laboratories and Instruction in American Universities and Colleges, by Conway MacMillan.

On the Quantitative Analysis of the Colors of Flowers and Foliage, by J. H. Pillsbury.

The minute Structure and Development of the Motile Organ in the Leaf of the Red-bud, by S. G. Wright.

The Shrinkage of Leaves in drying, by Byron D. Halsted.

Distribution of the Gramineæ in the United States, by S. M. Tracy.

A Consideration of Species based on the Theory of Evolution, by N. L. Britton.

A Revision of the Genus *Physcomitrium*, by Elizabeth G. Britton.

Deviation in Development due to the use of Unripe Seeds, by J. C. Arthur.

The principal Diseases of *Citrus* Fruits now being studied at Eustis, Fla., by W. T. Swingle.

Cephaluros mycoidea and *Phyllosiphon* sp., two Parasitic Algæ, new to North America, by W. T. Swingle.

An Analysis of the Conditions affecting the Distribution of Plants, by Frederick V. Coville.

A Sclerotium Disease of Plants, by P. H. Rolfs.

Notes on *Ræstelia pyrata*, by L. H. Pammel.

Crossing of Cucurbits, by L. H. Pammel.

A case of poisoning by the Wild Parsnip, *Cicuta maculata*, by L. H. Pammel.

Ulota Americana, Mitten, and *Orthotrichum Americanum*, Beauv., by Elizabeth G. Britton.

Palæobotanical Papers read before the Section of Geology and Geography, A. A. A. S., Madison, Wisconsin, 1893.

PAPERS BY JOS. F. JAMES.

"*Remarks on the Genus Arthrophycus.*"—Attention is called to the fact that this organism was originally described by Harlan in 1831, under the name *Fucoides Alleghaniensis.* In 1838 Conrad changed it to *Fucoides Harlani*, and when, in 1852, Hall changed the generic name to *Arthrophycus*, the specific name given by Conrad was retained, and this is the one under which it has been generally known. In accordance with the rules of priority, it should appear as *Arthrophycus Alleghaniensis* (Harlan).

"*Studies in Problematic Organisms; the Genus Fucoides.*"—A revision of the classifications under which various problematic organisms have been placed in the attempt to differentiate them or to identify them with living algæ genera. The author outlines a new scheme of classification based upon recent researches, which have proved many of the so-called algæ to be inorganic markings, tracks of animals, etc., and have also added to the more exact determination of the affinities of many which are true algæ.

"*The Value of Pseudo-algæ as Geological Guides.*"—The author concludes that, inasmuch as the evidence of the organic nature of many of the so-called fossil algæ is defective, any deductions based upon the presence of many described species are valueless and misleading, and that they are not safe geologic guides.

PAPERS BY ARTHUR HOLLICK.

"*Recent Discoveries in the Cretaceous Formation on Long Island.*"—The author notes the discovery, during the past summer, of cretaceous plants on the north shore of Long Island, at localities not previously reported, thus extending the known range of the cretaceous strata on the islands.

"*Some Results obtained in Recent Examinations of the Yellow Gravel Formation in New Jersey and Northeastward.*"—In this communication reference is made to the discovery of fossil leaves in the incoherent yellow gravel sandstone at Atlantic Highlands, N. J. The specimens, although fragmentary, are apparently similar to those previously found in the same formation at Bridgeton, N. J. ARTHUR HOLLICK.

Proceedings of the Madison Botanical Congress.

During the summer of 1893 a committee of American botanists was appointed by Prof. C. E. Bessey, Chairman of the Section of Botany, American Association for the Advancement of Science, and Prof. W. P. Wilson, President of the Botanical Club associated with the same institution, to arrange for a Botanical Congress, to be held at Madison, Wisconsin. The call of this committee for such a congress will be found on page 298 of the present volume of the BULLETIN.

The Congress met in Science Hall, University of Wisconsin, Madison, at 10 a. m., Wednesday morning, August 23, 1893, and was called to order by Prof. J. C. Arthur, Chairman of the committee.

The following resolution, offered by Prof. C. E. Bessey, was unanimously adopted:

Resolved, That inasmuch as the attendance of European botanists at this meeting has fallen much below the expectation of the organizing committee, so that the desired international character of the assemblage has not been realized, the name of this body be the "Madison Botanical Congress."

A committee, consisting of Prof. N. L. Britton, Prof. C. E. Bessey, Mr. J. J. Davis, Prof. S. M. Tracy and Prof. Conway Macmillan, was appointed to nominate officers for the Congress.

On the report of this committee, the Congress was officered as follows:

President—Edw. L. Greene.

Vice-Presidents. Henri L. de Vilmorin.
Lucien M. Underwood.

Secretaries. J. C. Arthur.
F. V. Coville.
B. L. Robinson.

Treasurer—C. R. Barnes.

M. de Vilmorin presided over the first session of the Congress.

Communications were received from Professors Ascherson and Engler, of the International Committee on Botanical Nomenclature, appointed at the congress held last August at Genoa, Italy, and from Dr. Otto Kuntze. They were referred to the American members of the International Committee, Profs. N. L. Britton, John M. Coulter and Edw. L. Greene.

Topics for consideration by the Congress were suggested by the organizing committee, and the following were selected and referred to committees for preparation before presentation:

1. The Nomenclature of Plant Diseases.

Committee. Byron D. Halsted, Chairman.
W. T. Swingle.
L. R. Jones.

2. The Terminology of Anatomy and Morphology.

Committee. Douglas H. Campbell, Chairman.
Conway MacMillan.
C. R. Barnes.

3. The Terminology of Physiology.

Committee. J. C. Arthur, Chairman.
W. T. Swingle.
A. S. Hitchcock.

4. The Nomenclature of Horticultural Forms.

Committee. Wm. Trelease, Chairman.
Henri L. de Vilmorin.
B. L. Robinson.

5. Bibliography and Typography.

Committee. C. R. Barnes, Chairman.
A. B. Seymour.
N. L. Britton.

A committee consisting of M. de Vilmorin and Mr. Coville were appointed to draft suitable resolutions regarding the death of M.

Alphonse DeCandolle, and one consisting of Professors Coulter and Britton, to draft similar resolutions relative to the death of Dr. Geo. Vasey.

The Congress convened again on the following morning, the President in the chair.

Professor L. M. Underwood suggested as an additional topic for discussion: 6. The Terminology of Plant Geography. The suggestion was adopted, and the following committee appointed to prepare for its presentation: Mr. F. V. Coville, chairman; Mr. W. T. Swingle, Prof. L. M. Underwood.

In the absence of Prof. Coulter, Prof. Bessey was appointed to serve on the committee to submit resolutions relative to the death of Dr. Geo. Vasey.

Prof. W. A. Kellerman, Miss Susan Hallowell and Dr. B. L. Robinson were appointed a committee on resolutions.

The committee appointed to submit resolutions regarding the death of M. Alphonse DeCandolle reported as follows:

In response to a common sentiment the members of the Madison Botanical Congress desire to express their sorrow at the death of Alphonse De Candolle, and at the same time their profound admiration for the greatness of his life and his work.

To him we have looked up as the patriarch, in our times, of systematic botany; and from him we have received not alone the example and incentive for the highest standard of scientific work, but the greater lessons of magnanimity, dignity and simple truth.

We feel deeply the loss of such a friend, notwithstanding the ripeness of his age and the completeness of his work.

HENRI L. DE VILMORIN,
F. V. COVILLE,
Committee.

The report was accepted, ordered engrossed, signed by officers of the Congress and transmitted to the family of the deceased.

Prof. Halsted presented the report of the committee on the Nomenclature of Plant Diseases. This and the other reports together with their discussion will be published in the official proceedings of the Congress. After much discussion the report was referred to a standing committee of seven, consisting of the three members presenting the report and Professors Bessey, Kellerman, Atkinson and Mr. Galloway; the committee was requested to report at the next meeting of the Section of Botany, A. A. A. S.

The report of the committee on the Terminology of Plant Physiology was presented by Prof. Arthur. After full discussion, it was referred to a committee of five, consisting of the three members presenting the report and Professors Barnes and MacMillan; the committee was requested to report at the next meeting of the Section of Botany, A. A. A. S.

The report of the committee on the Terminology of Anatomy and Morphology was presented by Prof. MacMillan. A committee of five, formed by the addition of Prof. Farlow and Mr. Roland Thaxter to the three members making the report, was appointed to further elaborate the subject and report it as in the two preceding cases.

Prof. Trelease presented the report of the committee on the Nomenclature of Horticultural Forms, recommending that for the present the nomenclature of Nicholson's Dictionary of Gardening and the Index Kewensis be followed.

Professor Barnes reported for the committee on Bibliography and Typography, submitting a typographical scheme for the citation of authors, which was adopted, and recommendations for securing a complete bibliography of literature relating to American botany, and the production of uniform card indexes to species, plates and papers, which were referred to a committee of five with power to consider and approve means of publication. This committee consists of Prof. Barnes, Mr. Seymour, Prof. Britton, Mrs. Alice F. Stevens and Prof. A. S. Hitchcock. This committee subsequently met and recommended the continuation of the Index to Recent Literature relating to American Botany published in the BULLETIN, with some modification of its present arrangement and typography, and approved the issue of card indexes to American species and illustrations of American plants as submitted by Mrs. Stevens and Miss Clark of the United States Department of Agriculture.

Professors Bessey, Britton and Kellerman were appointed a committee to memorialize the United States Congress and the Secretary of Agriculture to provide safe and commodious quarters for the National Herbarium.

The committee appointed to prepare resolutions relative to the death of Dr. Geo. Vasey, reported as follows:

The death of Dr. Geo. Vasey, Botanist of the United States Department of Agriculture, which occurred on March 4th, 1893, has called from us one of America's most widely known scientists. Dr. Vasey occupied for more than twenty years the most prominent botanical position in the gift of our national government, and administered the duties of his office in a most effective and enlightened manner. It is due to his continued exertions that our National Herbarium has attained its present rank as one of the chief centres of botanical research. His extensive contributions to the literature of the Gramineæ have made his name familiar to botanists of all countries. Be it therefore

Resolved, That the Madison Botanical Congress realizes that in the death of Dr. Vasey botanical science has suffered a most serious loss; and

Resolved, That this preamble and resolutions be entered on the minutes of the Congress, and that a copy be engrossed, signed by the officers of the Congress, and transmitted to the family of the deceased.

CHARLES E. BESSEY,
N. L. BRITTON,
Committee.

Mr. Coville presented the report of the committee on the Terminology of Geographical Botany. The report was accepted and the committee requested to continue the consideration of the subject and submit it at the next meeting of the Section of Botany, A. A. A. S.

It was resolved that the secretaries of the Congress be authorized to publish and distribute the proceedings, and that the expense of such publication not met by funds available to the Organizing Committee be assessed on the members of the Congress.

The committee on memorializing the government relative to the National Herbarium reported as follows:

Whereas, The National Herbarium, with all its wealth of specimens of inestimable value, is at present deposited in a building which from its construction and use is peculiarly liable to destruction by fire; and

Whereas, Such destruction would be an irreparable loss to the science of botany. Therefore, be it

Resolved, That we, the members of the Madison Botanical Congress, hereby appeal to the Senators and Representatives of the National Congress to make early provision for a suitable fireproof building for the preservation of this scientific treasure, and we would respectfully request the Secretary of Agriculture to urge upon Congress the desirability of prompt action in this matter.

CHARLES E. BESSEY,
N. L. BRITTON,
W. A. KELLERMAN,
Committee.

Resolutions tendering the cordial thanks of the Congress to Prof. Chas. R. Barnes and other members of the local committee of arrangements for their arduous labors in behalf of the comfort and entertainment of the members, and to Dr. Otto Kuntze of Friedenau, Germany, for a supply of his pamphlets containing proposed amendments to the Paris Code of Nomenclature, were reported by the Committee on Resolutions and unanimously adopted.

The Congress then adjourned.

N. L. BRITTON.

Organization of a Society of American Botanists.

At the meeting of the Botanical Club of the American Association for the Advancement of Science, held at Madison, Wisconsin, August 23, 1893, a committee of ten botanists was selected by ballot to choose fifteen others, these twenty-five to be charter members of a new botanical society. The committee met the following morning and performed the duty assigned, the charter members thus chosen being as follows: J. C. Arthur, G. F. Atkinson, L. H. Bailey, C. R. Barnes, C. E. Bessey, E. G. Britton, N. L. Britton, D. H. Campbell, J. M. Coulter, F. V. Coville, Daniel C. Eaton, W. G. Farlow, E. L. Greene, B. D. Halsted, Arthur Hollick, Conway MacMillan, B. L. Robinson, C. S. Sargent, F. L. Scribner, J. Donnell Smith, Roland Thaxter, Wm. Trelease, L. M. Underwood, Lester F. Ward, W. P. Wilson.

Two informal meetings of those of the above list in attendance on the Madison Botanical Congress were subsequently held, and a committee of organization appointed consisting of Prof. Wm. Trelease, Chairman; Prof. J. M. Coulter, Prof. Conway MacMillan, Prof. L. H. Bailey and Prof. C. S. Sargent.

This committee was instructed to inform the others of the twenty-five charter members of the action taken, to draw up a constitution and to report at a meeting to be held beginning on the Monday preceding the next meeting of the American Association for the Advancement of Science, and at the same place selected for the meeting of that association. Numerous topics were discussed at these informal meetings, among them the name of the new organization for which the terms American Botanical Society, Botanical Society of America and Society of American Botanists were proposed; the standard of membership to be maintained; the question of one or more classes of members; the fees for membership and initiation; the work of the organization, including publication, the number of annual meetings and the encouragement of research. No formal action on any point was taken, but the opinions of those present were obtained and ordered referred to the chairman of the committee of organization.

Botanical Notes.

Aralia nudicaulis, L., var. *elongata*, n. var.—Leaves longer and narrower than the type (5–6 in. long, by 1½ in. wide) gradually tapering to a point, rounded at base, coarsely and irregularly serrate, decidedly paler beneath.

I collected this on July 11 in the Catskill Mountains, on the top of Cairo Round Top, Greene county, at an elevation of about 2,000 feet. It was growing in a rocky woods with the type. I saw several sterile plants, but collected only one in fruit. While the fruit on a specimen of the type, collected within a few feet of this, was perfectly green, the fruit of the variety was entirely ripe. I did not have an opportunity to verify this, however.

The leaves seem to be 3-foliolate, with a tendency in the terminal leaflet to divide to the base, giving the leaf a very odd and characteristic appearance. GEO. V. NASH.

CLIFTON, N. J., Sept. 6, 1893.

Carex arctata, Boott., var. *Faxoni*, Bailey.

A single specimen of this rare sedge was collected by me at Grayling, Mich., in 1889. It had not been previously found in the lower peninsula of this State, and so far as I know, has been reported only from Isle Royale and Keweenaw county, Mich., the extreme northern part of Minnesota, Canada, and Lisbon, N. H. The last-named locality is in about the same latitude as Grayling, and these are the most Southern stations. G. H. HICKS.

AGRICULTURAL COLLEGE, MICH., Aug. 2, 1893.

Index to Recent Literature Relating to American Botany.

Acanthorhiza aculeata. (Bot. Mag. t. 7302).

Description and illustration of this Mexican palm.

Adiantum pedatum (Meehan's Month. iii. 113, with colored illustration).

Anthurium Chamberlaini. J. D. Hooker (Bot. Mag. t. 7297).

A superb Aroid, presumably native of Venezuela.

Asplenium septentrionale—A new Station for. D. C. Eaton (Zoë, iv. 185).

Record of the occurrence of this fern in Lower California.

Botanical Nomenclature. Katharine Brandegee (Zoë, iv. 182–184).

Botanical Notes from Texas. E. N. Plank (Gard. and For. vi. 332).

Notes on the rare *Berberis Swaseyi*, Buckley, and a short biography of Jacob Ferdinand Lindheimer.

Botany and Forestry. W. J. Beal (Annual Rep. Sec. State Board Agric., State of Michigan, xxxi. reprint, 1893).

A short history of the Botanical Department and report of the exercises of the laying of the corner-stone of the Botanical Laboratory.

Brasilianischen Nutz-und Heilpflanzen—Die. Theodor Peckolt (Pharm. Runds. xi. 181).

Discusses principally species of the genus *Aristolochia.*

Caladium venosum. N. E. Brown (Gardn. Chron. xiv. 86). Description of two new species from Brazil.

California Yellow Bells. C. R. Orcutt (West. Am. Scientist, viii. 38).

With figure of *Emmenanthe penduliflera.*

Cell-union in herbaceous Grafting. John S. Wright (Bot. Gaz. xviii. 285–293; two plates; reprinted).

Collinsia—A new. S. B. Parish (Zoë, iv. 147).

Description of *C. Davidsonii* from the Mojave Desert.

Crotalaria longirostrata. J. D. Hooker (Bot. Mag. t. 7306).

Native of Mexico.

Dipladenia eximia. W. Botting Hemsley (Gardn. Chron. xiv. 120). A newly described species from South America.

Draparnaldia—Observations on the Zoospores of. L. N. Johnson (Bot. Gaz. xviii. 294–298; one plate).

Evaporation of Water from Plants—Some Recent Investigations on the. Albert F. Woods (Bot. Gaz. xviii. 304–310).

Field Notes at San Emidio. Alice Eastwood (Zoë, iv. 144–147).

Flora of Guadalupe Island—Notes on the. F. Franceschi (Zoë, iv. 130–139).

Notes on 60 species and varieties.

Flora of Ohio—New Plants for the. Wm. C. Werner (Ohio Agric. Exp. Sta., Tech. Series, Bull. No. 3; extract).

Notes on 49 species, hitherto unrecorded from the State, among them *Aconitum Noveboracense*, *Cardamine arenicola*, *Elodes petiolata* and *Opuntia Rafinesquii*.

Flora of Southern California—Additions to the. S. B. Parish (Zoë, ix. 160–167).

Record of new localities for a large number of species.

Forestry for 1892—Report of the Chief of the Division of. B. E. Fernow (U. S. Depart. Agric. 1893, illustrated).

Fungi of Wisconsin.—A Supplementary List of Parasitic. J. J. Davis (Trans. Wisc. Acad, ix. 153–188; reprint).

Notes on 495 species, supplementary to Prof. Trelease's list of 1882.

Habenaria—The Genus. H. S. Pepoon (Asa Gray Bulletin, No. 2, pp. 8, 9).

Hepaticarum species novæ—II. F. Stephani (Hedwigia, xxxii. 137–147).

Anastrophyllum ciliatum, from Staten Island, Patagonia; *Anthoceros Dussii* from Martinique; *Anthoceros planus* from Brazil; and *Balantiopsis Chilensis* from Chile are described as new.

Hickory—Our Shellbark. J. T. Rothrock (Forest Leaves iv. 56; illustrated).

Iris Caroliniana (Gard. and For. vi. 334, with figure).

Lichenes exotici, II. J. Müller (Hedwigia, xxxii. 120–136).

Thalloidima Spruceanum and *Pertusaria lævigata*, from Brazil; *Patellaria Magellanica*, from Southern South America; *Parathelium megalosporum*, *Pleurotrema Burchellii*, *Tomasellia nigrescens*, *Polyblastia cæsiella*, from Brazil; and *Pyrenula Cocoes*, from Barbadoes, are described as new.

Marine Diatoms in Fresh Water—The Occurrence of. A. M. Edwards (Journ. N. Y. Micros. Soc. ix. 71–72).

New Localities for California Plants. T. S. Brandegee (Zoë, iv. 148–160).

Notes on a large number of species. *Claytonia saxosa*, *Chorizanthe Vortriedei* and *Chlorogalum purpureum* are described as new.

New or Noteworthy North American Plants. John M. Coulter and E. M. Fisher (Bot. Gaz. xviii. 299–303).

New species and varieties are proposed in the genera *Petalostemon*, *Astragalus*, *Hedysarum*, *Aster*, *Mimulus*, *Pentstemon* and *Plantago.*

Note on Nomenclature. Georg. B. Sudworth (Gard. and For. vi. 324).

Since the publication of the author's notes on *Bladhia paniculata* (Nutt.) *Ardisia Pickeringia*, Nutt.) it has been found that the genus *Icacorea*, Aublet, antedates the genus *Bladhia* by nine years. In consequence of this *Bladhia paniculata* becomes *Icacorea paniculata.*

Notes from the Gull Lake Biological Station of the University of Minnesota. Conway MacMillan (Bot. Gaz. xviii. 315, 316).

Record of the occurrence of root-hairs in *Elodea Canadensis*, and of the excessive luxuriance of *Equisetum limosum* at Upper Cullen Lake.

Notes on the Distribution of Trees and Shrubs in the Deserts and Desert Ranges of Southern California, Southern Nevada, Northwestern Arizona and Southern Utah.—Notes on the geographic and vertical Distribution of Cactuses, Yuccas and Agave of the same Territory. C. Hart Merriam (North American Fauna, No. 7, pp. 285–343, 345–359; reprint).

An important contribution to the geographical botany of the region, preliminary to Mr. Coville's report on the Botany of the Death Valley Expedition, now in press.

Ohio Plants—Notes on Distribution of and Stations for a few rare and interesting. Wm. C. Werner (Ohio Agric. Exp. Sta. Tech. Series, Bull. No. 3; extract).

Notes on 17 species.

Pepperidge Tree—The. O. C. Simonds (Am. Gardening, xiv. 469).

With illustration of *Nyssa aquatica.*

Phænogams—The Leader of the. James A. Graves (Asa Gray Bulletin, No. 2, 2–5).

Notes on Ranunculaceæ observed about Susquehanna, Pennsylvania, and an explanation of the position of this order at the beginning of the botanical sequence of De Candolle.

Pilze aus dem konigl. Botanischen Museum in Berlin.—Einige neue. P. Hennings (Hedwigia, xxxii. 61–64).

Puccinia xylariiformis, from Chile, is described as new.

Pilze Chiles, soweit dieselben als Nahrungsmittel gebraucht werden. F. Philippi (Hedwigia, xxxii. 115–118).

Plants Collected in Southeastern Utah, with Notes and Descriptions of New Species—List of. Alice Eastwood (Zoë, iv. 113–127; two plates).

Notes on 141 species, *Cæsalpinia repens*, *Asclepias involucrata*, var. *tomentosa*, *Gilia Triodon*, *G. superba*, *Phacelia nudicaulis* and *Pentstemon Utahensis* being described as new.

Primitiæ Floræ Costaricensis—II. T. Durand and H. Pittier (Bull. Soc. Bot. Belg. xxxi. 119–216).

Continuation of the narrative of the botanical exploration of Costa Rica, supplemented by the enumeration of the Mosses collected by M. Pittier, contributed by M. M. Renauld and Cardot, new species being described in the genera *Dicranella*, *Dicranum*, *Campylopus*, *Holomitrium*, *Fissidens*, *Leptodontium*, *Hyophila*, *Barbula*, *Macromitrium*, *Philonotis*, *Breutelia* (*B. Brittoniæ*, the same as Dr. Rusby's 3,137 from Bolivia), *Acidodontium*, *Brachymenium*, *Bryum*, *Atrichum* and *Pogonatum;* the enumeration of the Hepaticæ by F. Stephani, new species being described in the genera *Aneura*, *Anthoceros*, *Chiloscyphus*, *Frullania*, *Herberta* and *Plagiochila*, and of the Compositæ by F. Klatt, where new species are described in *Piptocarpha*, *Eupatorium*, *Mikania*, *Gymnolomia*, *Montanoa*, *Aspilia*, *Zexmenia*, *Viguiera*, *Calea*, *Liabum*, *Schistocarpha* and *Senecio.*

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VOL. XX. OCTOBER, 1893. No. 10.

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BULLETIN
OF THE
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Vol. XX. Lancaster, Pa., October 20, 1893. No. 10.

Contribution to the Probable Biology of Plasomen.

By Albert Schneider.

It is only for few years that the theory of the cell unit has been wholly exploded. Since then many valuable discoveries have been made in regard to cell structure. Brücke, Altmann, Hartig, Nägeli, Flemming, Stricker, Strassburger, Guignard, Schmitz, Berthold, Boveri, Bütchli and Wiesner are a few of the leading scientists who have made valuable contributions to cytology. We must, however, not forget workers of lesser note whose contributions in the aggregate are indeed of great value.

Scientists are now agreed that the cell, which has been heretofore considered the ultimate unit of structure, is made up of a multitude of simpler units combining to form, so to speak, cell organs, as cell wall, chromoplastids, cell granules, chromotin threads, nucleoli, etc. All efforts to show that protoplasm (cytoplasm) is a homogeneous substance with a definite arrangement have been futile. Among the recent workers, Bütchli has endeavored to show that cytoplasm always has a reticulated (wabenartige) structure. That such a structure is often noticeable is certainly true. It is likewise true that often such a structure is not noticeable. Such efforts, especially when too strongly prompted to conform to some preconcieved notion, lead to no good results, but rather create scientific distrust and confusion.

That cytoplasm is not a homogeneous substance is now generally accepted. It is supposed to be made up of a multitude of ultimate living units of structure. Wiesner has probably formulated the most plausible theory in regard to these ultimate units which he has designated plasomen. The plasomen, like Nägeli's micellæ, have thus far only a hypothetical existence. The following is a brief summary of Wiesner's reasons for assuming the existence of plasomen.

1. The more or less constant presence of organized individuals (nucleus, plastids, etc.) in the cell teaches conclusively that the cell cannot be the ultimate unit of living structures.

2. Since all organized individuals of the cell originate from similar organized individuals, through division, it is to be supposed that all organized bodies found within the cell are not formed spontaneously but through fission.

3. Mitosis teaches that the nucleus as well as cytoplasm consists of autodivisible organic individuals. From this we are induced to conclude that the nucleus and cytoplasm are not the ultimate units of structure, but that *they* are built up of ultimate units. The origin and development of the cell wall indicates that it is also made up of ultimate units.

4. Autodivision within the cell goes beyond the limits of direct observation. A limit to the divisibility of living substance must exist. These last divisible living bodies of the cell are to be considered the ultimate units of structure (elementarorganismen). These ultimate units Wiesner designates plasomen.

5. Plasomen have above all the power to divide, and since they divide continuously up to a certain limit they must also have the power to grow; but growth necessitates assimilation; hence divisibility, growth and assimilation are preëminently the properties of plasomen.

6. Organic cell individuals (nucleus, plastids, cell wall, dermatosomen, etc.) are plasom aggregates. Cytoplasm is simply a multitude of undifferentiated plasomen.

7. Growth of cytoplasm, of cell wall, nuclei, plastids, takes place as does the growth of many-celled organisms; the latter grow as the result of cell growth and division, the former as the result of plasom division and growth.

It is not my intention to discuss or explain Wiesner's theory, but rather to give what I hold to be additional evidence as to the correctness of his assumptions. While examining root tubercles of *Cycas revoluta* I noticcd that the palisade layer cells contained many rather large cytoplasmic granules (dermatosomen, zell granula, elementarorganismen, etc.). They are highly refractive, spherical in shape, and in size varying, beginning at the limits of of observation to one half mikron (μ) in diameter; a few are as much as one μ in diameter. Only the larger ones were noticeable with the objectives at my disposal (Zeiss 2.0 mm. hom. imm. ap. 140). On the addition of aqueous cor. sub. solution ($\frac{1}{100}$ per cent.) they took on a dark stain and were brought to view very much better. It was seen that the protoplasm was made up of granules of all sizes up to the limit given. Most of the aniline dyes stain them more or less. To my knowledge nothing is superior to the above mentioned sublimate solution. In the case of *Cycas* root tubercles it seems to answer much better than Altmann's method, which consists in adding alcoholic sublimate solution followed by acid fuchsin stain. The fact that I noticed quite a number of hourglass forms led me to suppose that they underwent division, though Wiesner states that they probably have lost the power to do so. I made some culture experiments, not with the expectation of developing a culture of plasomen, but rather, if possible, to study their vitality outside of the cell. Cycad tubercles were carefully washed, then dried quickly by means of blotting paper which had been passed through the flame of a Bunsen burner; then the tubercle itself was passed through the flame so as to singe it on all sides. With a sterilized knife the dermal layer was cut down one side and the tubercle broken (not cut) across. The inoculations were then made from the green palisade layer upon various agar-veg. extract media. The inoculated tubes were then placed in a dark incubator at a constant temperature of 35° C. After from three to five days a small growth was noticed in most tubes at points of inoculation. Examination showed the presence of cocci and bacteria. Treating with aqueous sub. sol. showed also the presence of plasomen. These were introduced with the inoculating needle and became more or less intermixed with the cocci and bacteria culture. I made repeated examinations of these cultures at intervals of several days, always finding a few plasomen. After a period of three or four weeks I was no longer able to detect any. In a few tubes there was no development of bacteria. In these I could study the plasomen unobstructed. There was no visible growth, but examination showed the unmistakable presence of the plasomen. After a time more mature plasomen (dermatosomen) were noticeable, and these mature plasomen were evidently present in greater numbers than when the inoculation was made. In about three weeks from the time of inoculation the plasomen were nearly all mature, often united into small zoögloæ. I do not intend to state that all the plasomen, visible and invisible, introduced with the inoculating needle developed to maturity, since it is impossible even to conjecture the number introduced. I was at first inclined to ignore them, thinking they were probably byproducts of the bacteria and cocci. But their presence in inoculated tubes containing no bacteria, and their behavior with sublimate solution indicated that they were true Plasomen. I also made plasom cultures from developing tubers of *Solanum tuberosum* and growing roots of *Zea Mays* with similar results. In all cases there was for a time an apparent increase in the number of mature plasomen coinciding with a decrease in number of the smaller plasomen; later only mature plasomen were present, and finally these decreased in number until all had disappeared. In the case where entire cells were inoculated it was plainly noticeable that the mature plasomen increased somewhat in number until finally the cell contained only those developed to maturity. This phenomenon is also often noticeable in bacterial cells and cells of hyphal fungi found in culture media. The probably correct explanation of these phenomena is as follows: The plasomen of Wiesner have a veritable existence and are capable of developing into mature dermatosomen outside of the living cell. The plasomen can, however, not divide outside of the living cell. The reason for this latter supposition is that the dermatosomen do not continue to exist. The apparent reproduction or increase in number is due to the growth of the invisible plasomen to visible dermatosomen. As soon as all plasomen capable of growth have reached maturity apparent reproduction ceases, and the dermatosomen begin to decrease in number as they are scattered through the culture medium or become disorganized.

Cramer has observed the growth of cell walls of certain Siphonaceæ when separated from the living cytoplasm. Numerous other observations have been made to demonstrate that the cell wall of many plants is built up of living plasomen capable of considerable growth. Pfeffer and others are therefore far from right when they term the cell wall a dead substance.

The question whether cytoplasm, or to use a more correct expression, plasomen can be induced to divide outside of the living cell may be settled before very long. I believe it to be only a question of environment, and not a question of germ-plasm, as Wiesner and others seem to think.

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Botanical Notes from Bainbridge, Georgia.

By Aug. F. Foerste.

Rectangular Inflorescences.—Nature is usually a graceful designer. Many flowers rather stiff and insignificant in themselves become charming from the skillful taste with which they are arranged in inflorescences. Upon a person accustomed to be alert in seeking the beauties of nature, the first sight of *Siphonychia diffusa*, Chapman, produces a queer effect, half of surprise and half of discomfort. Here is a plant with its flowers laid out in rectangular inflorescences—cymes with a flat top, with quadratic outlines, or of a form which at once makes us wish to say parallelopipedon, as though the other dimensions were equally stiff and rectangular. In these rectangles the flowers are laid off almost with the precision of corn rows in a field. This general effect is not lessened, in what seems a vain attempt of nature at grace, by the way in which these rectangular inflorescences are arranged on the stem; for, the stems being almost prostrate, all the branches being terminated by inflorescences at such heights as to bring all the inflorescences to within approximately the same plane, and the inflorescences being all disposed with their diagonals vertical or parallel to the stem, their sides all become parallel, so that the final effect is that of a series of rectangular fields, set out in some Western landscape, where all lines run north and south or east and west. In the case of this plant, we might say northeast and southwest, northwest and southeast. The fact that adjacent cymes are sometimes disposed at slightly different levels, suggests the effects of hillsides. The plant must be seen to be appreciated. It should occur in every botanical garden.

The lower branches consist of, first, two opposite leaves, bearing in the axil nearest the stem an inflorescence about half the size of the two inflorescences into which the other branches divide. The flowers usually terminate the seventh node from the main stem, all the terminal buds of the branchlets except the last being terminated by abortion at the end of each node, so that the cyme is a product of seven successive branchings of the stem.

A curious Correllation between Sympodial Development of Branches and the Retention of Stipules in Leguminosæ.—Two species of *Crotallaria* were examined. In both cases the flowering peduncles representing the end of the stem are attached directly opposite the axil of a leaf, but usually a little below its level; one leafy branch arises from the axil of this leaf, and assuming the same direction as the stem apparently terminates it; another leafy branch starts from the axil of the leaf below, and is evidently axillary; four nodes intervene between successive flowering peduncles, so that the order of arrangement of the stem after it begins flowering: is two leaves usually without anything in their axils, a third leaf with a leafy branch in its axil, and a final fourth leaf with a leafy branch in its axil and the terminal flowering pedicel beyond the fourth leaf.

C. sagittalis, L., has long, narrow, inversely sagittate stipules, whose decurrent margins reach the node below in every case except along the first internode of each sympodial branch, which continues the leafy growth of the stem after the flowering peduncle has been thrust aside. Along this internode the decurrent margins of the stipules extend only half way down the internode, and in rare instances are confined only to the very top of this internode. These leafy continuations of the stem being in each case branches, though sympodial, of course have the first leaf of their one-half phyllotaxy in a lateral position, causing the decurrent margins of the stipules of the first internodes to be pressed by the front of the subtending leaf and the back of the flowering peduncles, and this may account for the abortion of part of its decurrent stipular growth.

C. ovalis, Pursh., offers in this respect a more interesting case. Here the two lower nodes show only the merest traces of stipules at the node itself. The third node at times has the stipules likewise almost obsolete, but usually the stipules are present, though of small size and decurrent for only half the length of the internode; much more rarely the stipules of this node nearly equal those of the fourth node. The fourth node always has the inversely sagittate and rather conspicuous stipules fully developed and the decurrent margins extending to the next lower node. In this case the suppression of the two lower stipules and of the lower part of the decurrent margins of the third can be less readily accounted for, and their full retention at the node preceding sympodial development is interesting. The number of instances in which flowering peduncles of Leguminosæ are extra-axillary through sympodial growth is rather larger than at first suspected. The Germans call these *uebergiphelte* inflorescences. The word sympodial expresses the opposite of these relations and is therefore not a good term with which to designate such inflorescences. Some better English term, meaning *thrust aside*, should be sought, and used in the manuals of botany for the many cases where such inflorescences occur. This would be a way to advance morphological botany. Unless such a word can be found, perhaps the term *superseded inflorescences* might do.

Cotton.—The cotton plant is of course so well understood that nothing of botanical interest can be added to our information. Attention is only called to the fact that the inflorescences here are again morphologically terminal, *superseded* by the sympodial growth of axillary branches. The flower of the upland cotton, *Gossypium album*, Ham., is pale yellowish or greenish white early in the morning. Towards noon it becomes tinged with rose, and in the later afternoon it is of a strong rose-red color. Changes of color of plants on fading indicate possibilities as to the normal colors of flowers in the distant future, or earlier by process of selection. Nature often has solved this problem already by giving to one species a color as a normal color which another species of the genus secures only on fading. In the Sea Island cotton, *G. nigrum*, Ham., the deep rose-red color is found normally, but only as blotches at the base of the petals on the inside. It would be easy to produce cotton with rose-red flowers.

The Practical Utilization of Phyllotaxy in Tobacco Culture. As soon as the flower buds of tobacco begin to appear quite generally in the fields, the tops of the tobacco plants are cut off. Depending upon the vigor of the plant, the existing conditions of rain, soil, etc., the plants are topped at various heights. An expert tobacco grower will top plants at heights varying with the vigor of the individual plants. When, however, he sends a less experienced "hand" into the field, as often he must, he looks at the field as a whole, and then instructs the hand to top the tobacco at the eighth, tenth or twelfth leaf, as the case may be. The hand, of course, does not stop to count. He looks at once for the ninth leaf, which is directly over the first, since the phyllotaxy is three-eighths. The eighth leaf is then the next one below, and the tenth the next one above, while the twelfth is directly above the space between the ninth and the tenth leaf.

In certain seasons it is found that the leaves are not going to mature equally from insufficient rain or other reasons. In that case some men remove the lower leaves nearest the ground, which are apt to ripen too fast under such circumstances. Other planters prefer to leave the lower leaves on, believing that they protect those above from dirt in case of splashing during rain. The more observant planters, however, know that the lower three leaves come beneath the spaces between the next three leaves, so that there is really no protection offered, as any one can see from the phyllotaxy, and so they cut the lower leaves off if the leaves are maturing too unequally. The planters have not studied the theoretical phyllotaxy, but they understand its practical applications.

Renewed Growth of Trees in Summer after having already once formed their Terminal Scaly Winter Buds.—Of course, scaly winter buds are designed by nature to protect the undeveloped tips of branches during the winter months. Moreover, the scales represent leaves, and that in a crude, undeveloped form, in what is called at times an arrested state of development, as more than necessary cases will readily demonstrate. And finally, hardly any one will deny that the presumption is in favor of a time when plants, and among them probably ligneous plants, did not possess any winter buds, but got along the best they could, freezing and hence dying back in colder climates, and more successfully bridging the non-growing season in more tropical regions. The development of winter buds must have been a gradual one, and it must have taken some time before they began the development of terminal scaly buds early enough to have made the matter very effective, and still longer before these buds were developed with the greatest economy of material and the greatest efficiency as protectors to the life within. At one time there must have been a very direct connection in time between the causes necessitating winter protection and the efforts of the plants to secure such a protection. What it is desired to especially bring under notice here is the fact that at present in ligneous plants this direct relation, though still apparent, shows the curious anomaly of presenting the effect in early spring and the cause not until the succeeding winter. In other words, in many ligneous plants the warmth of returning spring has hardly called the vital functions of the trees again into vigorous action before the growth for the year is completed, and a few weeks later a well-developed terminal scaly bud awaits the winter. Of course, this bud itself needs considerable maturing before it will attain all the characters necessary to endure the winter's cold, and the parts the scales of the bud are intended to protect must still, in a large measure, be developed. But the fact that the more terminal leaves have remained in the crude state of scales when all the freshness of spring was inviting them on to full development to vigorous leaves can not be overlooked. Nature is thus shown to plan for the future, and, to follow this metaphor, she can be said to be prescient, taking cognizance for the future, laying in her stores at a time when they are not needed, for future use. This is true in so many ways that it cannot fail to have attracted attention. It is mentioned here to explain another set of related phenomena.

A study of the new growth of the jack oak, *Quercus nigra*, L., in spring will show that the plant has the work for the present year all planned out. The growth of the year is already practically contained in the scaly buds. Before this year's growth is fully accomplished she begins to prepare for the next year's task, and she lays out only enough work to meet the requirements. The result is that there is a certain definiteness to this work, so that it is possible in a certain measure to foretell how much the plant will do from year to year. This definiteness must bear relations to conditions of climate found in certain areas from over the plant's range of distribution. In the case of many plants these conditions seem to be found over their more northern areas of distribution. The result is that northward the relations between the requirements as to the number of leaves necessary for the vigorous development of the plant and the provisions for the same are so well cared for in the amount of growth the plant arranges for from year to year that it is rather rare to find ligneous plants renewing their growth after having once formed their terminal buds. The correlations established for more northern areas lose in value, however, in going southward, and the result is that in the South many ligneous plants, after having already formed their terminal buds in the spring, begin to develop new growth again in the summer months, and again form terminal buds. Under exceptional conditions this may take place three or four times in the course of a year.

The black jack oak already mentioned forms a curious instance. It is very common, practically a weed on some plantations near Bainbridge. Cases of repeated renewal of growth are very common here. In the older trees growth has taken place twice during this year in the case of certain branches, each time with the formation of a terminal bud. In young sprouts coming up from the roots this renewal of growth has been quite general, common enough to present at least a few examples from any accidental point of view on the plantation. In some limited localities renewed growth has been almost general. In a case where a conflagration by destroying the growth of the present year had for a considerable time checked development, adventitious shoots have come forth, and have three times, in some cases four times, formed terminal scaly buds. It is interesting to notice how nearly equal is the number of internodes developed each time. It is a striking proof of the fact that this oak has by continual habit so developed the custom of producing a certain set of internodes and then a terminal bud, that the oak goes through this spasmodic repetition of growth and termination by winter buds, even at times when nature is favorable to a single longer continued growth, before winter buds *need* be prepared.

The dogwood, *Cornus florida*, L., may be mentioned as a similar instance, since its new growth is short and quickly formed, and composed of a fairly definite number of nodes. Some branches occasionally show evidences of two growths during one year.

The persimmon, *Diospyros Virginiana*, L., is also interesting. It is very common here as young low bushes, almost a weed, though not troublesome to the same extent as jack oaks. The number of internodes formed is much greater than in oaks, and is not so definite; only a moderate number of the nodes developed during each period of growth, being actually already indicated in the terminal bud. Still it is a good case, since cases of renewed growth after the terminal scar had been once formed are rather frequent in some areas, and are not rare anywhere. Probably the longer season southward, with abundant moisture, has considerable to do with it.

In the case of vigorous sprouts or shoots this tendency to renewed growth is naturally emphasized, as already noticed in the case of the jack oak. New shoots from a hickory stump presented another interesting phase of the subject. On the very same stump, with sprouts all of the same age, were found a few which had made their long growth during a single uninterrupted period. In one shoot the internodes moved closer together and the leaves grew smaller towards the middlle of its length, evidently preparatory to the formation of a terminal bud; but the shoot changed its mind, and the succeding leaves became more distant and larger until, later, the real terminal bud was formed considerably farther on. In another shoot the leaves were reduced to scales towards the middle of the shoot, but the internodes were still a little too great to admit of the formation of a scaly bud at this point. While in several cases the shoots had actually developed scaly terminal buds at one time, and later these had renewed growth; and, in a single shoot, growth had taken place spasmodically at three separate intervals.

In the case of the black jack oaks which had suffered from a conflagration, and later had sent out shoots, the new branches were exceptionally vigorous. If a plant ever bears superposed buds it is almost certain to show them in such instances. The failure of these shoots to show them makes it very improbable that superposed buds ever occur in jack oaks. Instead of that was found what usually under such circumstances is the alternative, the development of two additional but lateral buds. Since no evident leaves normally subtend the two lateral buds and the scales in oak buds represent only stipules, it was difficult at first to determine whether we have here a case of lateral dedoublement or of branching from the lowest axils of the central, usually larger bud. That the latter was the case was shown, however, by the presence, in several instances, of single full developed, large leaves in a lateral position at the base of the central bud, but subtending one of these lateral buds, while everything else about the various buds was in the form of the usual scales. In one instance the central bud had developed a single—the lowest—internode, and bore at the top of this internode, in the axil of the first scale, a small lateral bud, thus making with the two lower lateral buds a group of four scaly buds in this leaf axil.

Possibly palæobotany may some day shed light on the evolution of scaly winter buds. So far the fossil branches of dicotolydenous plants have been practically ignored. In the future they will no doubt be used to give corroborative evidence to the testimony as given by leaves alone, and we may hope for the day when the winter buds, wherever preserved, will be carefully studied.

Dropsical Pelargoniums.*

For the past two or three years there has been an increased number of complaints made to the Experiment Station of a disease among the hot house *Pelargoniums*. Specimens received from at least a dozen places all agree in the chief essentials, while there are many variations in the details of appearance to the unassisted vision.

While the trouble is most noticeable upon the leaf blades it is by no means confined there. Upon the stem it shows itself in peculiar corky ridges which are not unfrequent upon the petioles. Upon the blades the usual appearance is that of numerous specks which seem to be supercharged with water giving to those parts a clear amber look when held up to the light. The first thought was of bacteria, there being a resemblance of the watery glands to specks found in the carnation leaves previously studied and known to be due to micro-organisms.

After making a full test for bacteria and failing to secure germs or any signs of contagion by inoculation it was concluded that the *Pelargoniums* were suffering from a dropsical affliction, and instead of the trouble being due to any parasite it seems to be entirely physiological. Photo-impressions were taken of the leaves showing different phases of the disorder.

In a green-house devoted entirely to *Pelargoniums* the trouble may be seen upon nearly all the plants, in which case the middle aged leaves show the water-soaked appearance to best advantage. Later on moulds of the black (*Macrosponum*, sp.) or gray (*Botrytis*) sorts come in to obscure the view and hasten the destruction of the foliage. The leaves affected with the dropsy lose their healthy green color, become at first yellow only in spots or blotches, but finally so throughout.

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Occasionally a plant is so afflicted that it grows but feebly, and while pushing the normal number of leaves they remain small and are badly specked before unfolding. The whole plant has a very sick and stunted appearance, and, of course, is worthless. Plants that are spotted in a less severe manner may recover after a time when removed out of doors. The dropsy seems to be the worst in early spring after the young plants are in the pots and six inches in height, bearing a dozen leaves or so.

The most frequent form of the trouble is when the translucent dots are along the veins; this being true in particular of those plants which suffer most and are dwarfed beyond their fellows. Occasionally the leaves will be only partially unfolded, and the upper border brittle and without its normal color; but as a rule the blotches and pimples are quite evenly distributed, that is, no one-half or quarter being affected to the exclusion of the other parts.

It is true that in some leaves the parts bearing the bulk of the specks are between or farthest from the veins, while in others the trouble is quite generally confined to the veins. This may be a varietal effect or possibly due to age of leaf when first afflicted. Again, sometimes the blotches are exceedingly irregular in outline and in others almost circular and quite uniform.

The reason for this unhealthy condition of the pelargoniums is most likely to be found in the circumstances under which they are being grown. Prof. Atkinson has met with a similar trouble which he calls Œdema of the Tomato and treats fully in a recent Station Bulletin. He concludes that the tumors of the tomato plant are due to the excess of water favored by insufficient light, that is, a wet soil and a soil temperature near that of the air. The long nights, short days and cloudy weather of late winter, induce the dropsical trouble, especially with a wet warm soil, thus making root action excessive. The remedy would seem to be in providing a cooler, dryer soil with increased light for the aerial parts, whenever possible.

BYRON D. HALSTED.

Contributions to American Bryology, III.

BY ELIZABETH G. BRITTON.

NOTES ON THE NORTH AMERICAN SPECIES OF ORTHOTRICHUM.

A. Those with superficial stomata.

ORTHOTRICHUM OBTUSIFOLIUM, Schrad. Crypt. Gew. 14 (1796).

Though, as its name implies, the leaves of this species are generally blunt, yet Austin collected specimens on trees in a swamp, at Jordansville, N. Y., on December 15, 1879, having the "leaves either obtuse, or acute or even apiculate on the same stem." I have verified this statement, and also observed that the perichætial leaves are occasionally even acuminate, as seen on specimens recently collected by me on the Pocono Mountain, Pennsylvania, the specimens being in fruit, and the leaves bearing the propagula and dense papillæ, which are characteristics of this species.

Although it generally grows on trees, especially poplars, and has been collected on elms along highways, and on old apple trees, yet Austin also gathered it on limestone fences, Sussex Co., N. J., and on stone walls, Herkimer Co., N. Y. These specimens are smaller and darker green than usual, for Canadian and Western specimens as well as most European ones are often light yellow with stems 1–2 cm. long. This species is probably more common in the Eastern States than is supposed, but on account of its depauperate size and frequent sterility is seldom collected.

ORTHOTRICHUM STRIATUM (L.) Hedw.

O. leiocarpum, Br. & Sch. Br. Eu. t. 220 (1837).

Sullivant and Lesquereux distributed this species as number 183, Musci Bor. Am., Ed. II., 1865, mixed with *O. affine*, presumably from two localities, as the label reads: Hab. in iisdem cum praecedente (Agassiz); etiam per montes Novaeboracenses. The first locality was Lake Superior, the second locality is not cited in the Manual, and we have seen no specimens except from the one referred to above and those collected in Idaho by J. B. Leiberg; the species seems to be very rare in America. Number 183 agrees with the description given by Limpricht, and with European specimens, and is particularly noticeable for the broad, erose cilia, alternating with and nearly as broad as the teeth and often united by transverse bars.

In Austin's herbarium this species is confused with *O. speciosum*, which also has smooth capsules, but they are longer and cylindric, not ovoid, and are more exserted; the teeth are in pairs, not single, and the cilia are 8, not 16, and much narrower and tapering. An autograph specimen from T. P. James, collected at Errol Dam, N. H., is also *O. speciosum*, labelled *O. leiocarpum*, and he and Austin seem to have confused all their correspondents, for there are specimens wrongly so labelled, from Macoun, collected at five Canadian localities, from Fowler in New Brunswick, and others, all of which prove to be *O. speciosum*. Macoun's Canadian Mosses, No. 126, distributed as *O. leiocarpum* is, in our set all *O. speciosum*, as the catalogue cites it. Sullivant had the two species correctly separated, as autograph specimens sent to Dr. Torrey show, and in later years Austin corrected his mistake.

ORTHOTRICHUM AFFINE, Schrad. Spic. fl. Germ. 67 (1794).

This species is very differently treated by the three European serials,* now in course of publication, and seems to be very variable, judging by the number of varieties described and the difference in the aspect of the specimens.

It has a strongly ridged exserted capsule, with a short immersed seta, long, tapering neck, and the teeth reflexed when dry, united in pairs, (4) with eight erect cilia. But it varies from yellow to almost black, and in size from 1–5 cm.; also the capsule is either immersed or almost entirely exserted, cylindric or urceolate with a flaring mouth, and the teeth are more or less trabeculate at apex. Venturi keeps it separate from *O fas-*

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*Venturi, Musc. Gall. Part VI. (1887). Braithwaite, British Mosses, Part XII. (1889). Limpricht, Laubmoose, Part XV. (1891).

tigiatum, Bruch; so does Limpricht, but on different characters, Venturi basing the distinction on the papillæ and upper cells of the leaves, whereas Limpricht distinguishes them by the teeth being striolate in *O. fastigiatum*, and papillose in *O. affine*. Braithwaite maintains *fastigiatum* as a variety distinguished by the smaller size and dark green color of the plants, and the urceolate capsule. It will be noted, also, that although Venturi places *affine* among the species with superficial stomata in his key, he figures it with the cells around them overlapping the guard cells. Braithwaite figures them radiating.

The stomata are described by Limpricht as being in two rows around the middle of the capsule in *O. affine*, whereas in *O. fastigiatum* they are said to be few around the base of the spore-sac. The typical form of *O. affine* is described by Venturi as having an exserted oval cylindric capsule, the plants being yellowish green and laxly pulvinate, though in the general description he says they may be yellow or dark green with capsules emergent or rarely almost immersed. Limpricht states that the cells of the leaf are thickened throughout in *O. affine*, though not in *O. fastigiatum*, and Venturi claims that the apical cells of *O. fastigiatum* are hexagonal and rounded in *O. affine*. This would agree with Limpricht's observations on the thickening of the walls.

ORTHOTRICHUM FASTIGIATUM, Bruch; Brid. Bryol. Univ. i. 795, 1826.

Sullivant and Lesquereux distributed as *O. affine*, in No. 182 of the 2d Ed. of Musci Bor. Am. two markedly different specimens, collected by Agassiz around Lake Superior, one tall and yellow with long cylindric exserted capsules, the other small and black with immersed urceolate capsules; the latter have striolate and trabeculate teeth, the former has the teeth entire, not trabeculate, and faintly striolate. Evidently then we have the same problem here as they have in Europe, only our material is so scant that we cannot satisfactorily determine whether the two species intergrade or not. Agassiz and Macoun only, have collected around Lake Superior the specimens which agree with *O. fastigiatum*, and all other American specimens which I have seen seem to be *O. affine*. However, a comparison with descriptions of European specimens show that the main characters are constant.

ORTHOTRICHUM SORDIDUM, S. & L. in Austin's Musci App. 168 (1870).

Sullivant, Icones Supplement, 67, t. 49 (1874).

This species comes very close to *O. fastigiatum*, as described by Limpricht, agreeing with it in the trabeculate and striolate teeth. The form given by Sullivant (l. c. fig. 10) is seen occasionally, but the teeth are as often trabeculate at apex, as figured by Limpricht, even in James' own specimens from Cambridge, Mass., which are the ones referred to by Sullivant in the Icones. My experience is, that in the older capsules the delicate trabeculate apex of the teeth is broken off, and they appear as figured in the Icones, though I have seen on one capsule teeth of both kinds. Limpricht makes a point in the position of the stomata to distinguish *O. fastigiatum*, stating that they are few around the base of the spore-sac, whereas in *O. affine* he says they occur in two rows around the middle of the theca. I find in *O. sordidum* that they are usually median as in *O. affine*, but I have seen them both in one row and two. The cilia in *O. sordidum* seem always regular, not appendiculate. The capsule is more immersed and more regularly ovoid when mature, before it becomes sulcate, and the neck is shorter and more suddenly contracted, and almost always immersed and invisible in *O. sordidum*, while in American specimens of *O. fastigiatum*, collected at Lake Superior, by Macoun, the neck is almost entirely exserted. I do not understand why Venturi refers *O. sordidum* to the section of *O. arcticum*, as its alliance seems to me to be entirely with the species with which I have compared it, and its range is from Closter, N. J., almost at sea level to Kent county, New Brunswick, though it has been collected at Dixville Notch, N. H., by T. P. James; the original station being at Cambridge, Mass. The leaves also have the nodose, or porose lower cells, which are specially described by Limpricht in *O. affine* and *O. fastigiatum*. *O. sordidum*, though, seems to be more allied to *O. affine* in its leaves, for the lower cells have thickened walls, the ends in some cases projecting into papillæ, bringing two adjacent ends together so that the papillæ appear double; this gives this species a very characteristic appearance, which I have not observed in either of the others, as the base of the leaves is usually smooth and free from papillæ, though I think the amount of thickening of the basal cells depends on their position, the upper ones from the same plants being quite hyaline and smooth at base, with thin walls. Even the shape of the cells is variable, for they may be oblong and parallel with the vein, or they may be rhomboidal and oblique.

In reply to a recent letter of mine, Dr. Venturi says, concerning *O. sordidum*, that "the group of *O. affine* differs from that of *O. arcticum* only in the position and form of the papillæ on the surface of the teeth. These, like *O. affine*, have the papillæ more dispersed and irregular and occasionally truncate and reduced to intersecting lines, whereas in the group of *O. arcticum* the papillæ are smaller, more dense, and distinctly elevated. *O. sordidum* has the papillæ corresponding to the group of *O. arcticum*, not only in your specimen, but in all the others which I have examined. That would not prevent it, however, from being otherwise closely allied to *O. affine*."

ORTHOTRICHIUM LYELLII, Hook. & Tayl. Musc. Brit. i. 29 t. 22 (1818).

O. papillosum, Hpe. Linnæa, xiv. 458 (1860).

O. Pacificum, Hpe. ms. in Herb. Brit. Museum.

O. Sullivantii, Bauer; Austin in Bull. Torr. Bot. Club, vi. 343 (1879) (?).

O. Pringlei, Müller, Bull. Torr. Bot. Club, xiii. 121 (1886).

O. strictum, Vent. (sub-species nova) Bot. Cent. xliv. 419 (1890).

Such is the published synomymy of this species. Several times it has excited my curiosity, and the following notes and comparisons have been made. Two authentic specimens of *O. Lyellii* collected by Greville in Scotland, in Dr. Torrey's Herbarium are dark green plants with the leaves erect or secund, not crisped, though occasionally recurved or subsquarrose. They are plentifully sprinkled with brown propagula, and are distinctly papillose on both surfaces, or, as Braithwaite describes it, "with prominent conical papillæ." He says in a foot-note that Dr. Spruce found a marked form by the Ouse, near York, in 1843, with rigid closely appressed leaves.

O. papillosum, Hpe. l. c. (*O. Lyellii*, var. S. & L. Musci Bor. Am. Ed. ii. no. 185 (1865).)

O. Lyellii var. *papillosum*, Hpe.; L. & J. Man. 178 (1884).

"Leaves more highly papillose."

As the description given by the Manuel seems very meagre. Hampe's original is quoted:—Laxe cespitosum, adscendens, fusco-viride. Caulis curvatis, ramulosus, inferne nudus, superne planiuscula, foliis oblonga-lanceolata, cellulis alaribus subquadrato-angulatis, hyalinis, superne dense seriatis, elliptico-rotundis, inconspicuis, pagina folii papillis prominentibus scabra, nervo carinato, apice desinente. Theca sessilis, elliptica, leviter striata; peristomia simplici. In Mont. Sierra Nevada, Californiæ. ad saxa? (Bauer). Adnot. Specimini manca, tame species memorabilis foliis secundis. O. Texana, Sull. affine? We have seen the type of this species at the British Museum, and compared it with the specimens distributed by Sullivant & Lesquereux as no. 185 (l. c). The type and a portion of no. 185 agree in the dark green color of the plants, the erect, appressed, strongly papillose leaves, without any propagula. The greater portion of no. 185, however, in our set has the leaves squarrose, the stems more flexuose and the capsules more conspicuously exserted, approaching *O. Pringlei*, though the color is darker.

O. Pacificum, Hpe.; ms. was collected in 1862 by Bauer on granite rocks near San Francisco on the shore of the ocean. The plants are dark green, 6 cm. long, rigid, with appressed leaves and little fruit. The calyptras are immersed and hairy, the old capsules exserted on short pedicels and the lids are gone. It does not differ from *O. papillosum* sufficiently to be a species.

In Sullivant's herbarium I found the following note:

"*O. Lyellii* shows a most wonderful disposition to vary according to place of growth. The Californian and Oregon specimens differ only from the European in having longer, narrower leaves, more crisped and undulate on the margins when dry, and scarcely ever having on their surface the articulated glands (conferva orthotrichi). In nothing else is any difference perceptible." (Examined several times carefully.—W. S. S., Oct., 1856).

In the original description of *O. Lyellii* (Musc. Brit., p. 130), the leaves are described as follows: "On various parts of their surface the conferva orthotrichi grows in abundance, so that they appear strewn with a brown powdery substance."

I also have examined all the American specimens in our herbarium and many European; and the latter always differ from the former in the abundance of the propagula, as well as in being less crisped. All the American specimens at Kew are without propagula.

O. Sullivantii, Bauer, is referred to by Austin in the BULLETIN (l. c.) as "growing on trees, having the peristome reflexed when dry and the leaves of a different texture from *O. Hainesiæ*," but I can find no reference to it elsewhere. I have seen the specimens collected by Bauer, and they also have no filaments, and are probably *O. papillosum*, Hpe.

Orthotrichum Pringlei, C. Müller (l. c.)

Pringle's types were collected at Winchester Bay and Coos River, Oregon, and are remarkable for the light yellowish green color and flexuose branches, as well as for the curly leaves. Fine specimens have also been sent to us by Thomas Howell, from Yaquima Bay, in mats six inches across, unmixed with any other species. At first sight, it would not be referred to *O. Lyellii*, and without seeing the specimens growing and intergrading I should incline to maintain this as a species. In a letter from C. Müller, to whom I sent a series of specimens, he says, July 13, 1888, "Ich melde Ihnen, dass ich jetz damit einverstanden bin, mein *Orthotrichum Pringlei* ad forma longifolia crispata papillosa *O. Lyellii* zu bringen. Hampe nannte es einmal *O. papillosum*, ein anderer mal *O. Pacificum*."

I have seen all the types of Hampe's species referred to, and he never had any specimens corresponding to *O. Pringlei*. All his were dark green and rigid. The only other localities from which *O. Pringlei* is represented in our herbarium are Vancouver Island, collected by Macoun, May 17, 1875 (203), and a few scraps collected by W. H. Shockley, at Candalaria, Nevada, and part of S. & L. Musci Bor. Am. number 185, which also has flexuose branches, though the color is darker green, collected by Bolander in California. All the other specimens collected in California by Bolander, Watson and M. A. Howe are dark and rigid. J. B. Leiberg's specimens from near Lake Pend d'Oreille, Idaho, are bright green and stiff, and this is the easternmost locality represented in our herbarium.

Orthotrichum strictum, Vent., is described as a "subspecies of *O. Lyellii*, without propagula, and the leaves lanceolate and straight, the capsules short stalked, otherwise as in *O. Lyellii*."

I have not seen Roll's specimens, but from the description I see no differences sufficient for making a new sub-species when we have already several synonyms abundantly defined. I am not a believer in sub-species either, and question whether this is not *O. papillosum*, Hpe.

Renauld and Cardot, in their check-list of North-American mosses, maintain four species, Nos. 543–546. Probably only two of these will stand, *O. papillosum* and *O. Pringlei*.

A large suite of European specimens of *O. Lyellii* from the Jaeger Herbarium shows none approaching *O. Pringlei* in the general aspect of its curly leaves and flexuose branches.

ORTHOTRICHUM DOUGLASII, Duby. Mem. Soc. Phys. d'Hist. Nat. de Geneve, xix. 293, t. I. fig. 2 (1868).

Through the kindness of M. Barbey and M. Eugene Autran, of the Boissier Herbarium, I have seen the type of this species in Duby's herbarium, collected by Douglas on the Columbia River, in 1830. In comparing the specimens with the description, l. c., I find one discrepancy. The description reads as follows: "theca erecta cylindrica sub ore parum dilatata fuscescente ecostata basi subplicata." The capsules are not *ecostate*, for the walls show eight yellow bands of three or four rows of thickened cells, forming short ridges when the capsules are old and dry. The stomata are small and superficial, usually one at the termination of each band, in the middle of the theca, not around the base of the spore-sac; the surrounding cells are not much modified nor radiating. The following measurements may be of service in identifying the species, which has not been collected since it was described: Seta 2 mm. long, vaginule 1 mm. long, theca 2.5 mm. long and 1.33 mm. broad, the neck defluent into the seta, exserted beyond the perichætial leaves, which are 2–3 mm. long, 1 mm. broad, with a blunt apex, hyaline concave base, without a revolute margin. They almost entirely cover the seta. There are but a few capsules preserved; one is quite immature, with the calyptra still on, and the others are old and deoperculate, but Duby kept in a mica slide, mounted in balsam, the peristome from which the figures were drawn. Figure b. represents the teeth shorter, and with fewer segments than the original; they are erect when dry. The mouth is bordered by several rows of smaller cells, and there is a hyaline annulus. Figure d. also is poor, because the type has the neck defluent, and figure f. because the calyptra is lobed, distinctly striate, and is not nearly as wide as represented, its base clinging close to the base of the capsule, which, however, is immature. I compared the specimens with *O. Texanum*, number 187 of S. & L. Musci Bor. Am., ed. II., 1865, and with the plate of the latter in the Icones. The leaves are very similar, being carinate, with strongly revolute margins, the apex acute, and often plane for a short distance above the point where the vein disappears, or the vein may be percurrent. The base of the leaf in *O. Texanum* is narrower and more decurrent at the angles, and the margins are revolute to the base; the vein is broad and thick, often brown, and the basal cells are yellow, oblong or sinuous.

It seems probable that *O. Douglasii* must be masquerading under another name in our herbaria, but owing to the imperfect condition of the type, it would be difficult to prove this.

ORTHOTRICHUM KINGIANUM, Lesq. Mem. Cal. Acad. i. 18 (1868), Sull. Icon. Musc. Suppl. 74, t. 55 (1874).

When studying the mosses collected by J. B. Leiberg, I was permitted by Dr. Watson to examine the type of this species, which has only been collected once, by Bolander at the Falls of the Yosemite. It is closely allied to *O. lævigatum*, Zett., and the similarity will be apparent if the figures of both are compared. *O. lævigatum* is described as a variable species by Venturi, and is much more common in America than the Manual would indicate, as it cites only one locality in Western Nevada (Watson). Our specimens from this locality, No. 1404 Watson, are not this species but seem to be *O. Watsoni*. Macoun collected *O. lævigatum* at the Cascades at Yale in 1875, and Austin described it as *O. Macounii*, n. sp. (BULLETIN, vi. 343, 1879), but subsequently referred it to *O. Kingianum*. It has recently been distributed in Macoun's Canadian mosses as No. 454, and has been collected in two localities near Lake Pend d'Oreille by Leiberg, showing mixed with it forms with a broader pyriform capsule and shorter seta, as in *O. Kingianum*. More study and material is desirable of these four species.

B. Those with immersed stomata.

ORTHOTRICHUM ANOMALUM, Hedw. Musc. Frond. II. 192, t. 37 (1788).

I have not seen the type of this species, but it would be desirable to know whether it has the teeth united in pairs, and whether the cilia are present, as Limpricht maintains *O. saxatile*, Brid., on these characters. Braithwaite recognizes it only as *O. anomalum*, var. *cylindricum*, Sch., claiming that though Bridel's name is the older it should be rejected because it was used to include both *O. anomalum* and *O. saxatile*, forgetting that according to the Paris code the enlargement or restriction of a species does not warrant a change of name. Venturi also considers it only a variety of *O. anomalum*, but calls it var. *saxatile*.

We have found that No. 177 S. & L. Musci bor. Am., Ed. II., distributed as *O. anomalum*, agrees with the description of *O. saxatile* given by Limpricht, in having the teeth united in pairs, and eight cilia alternating with them; also the ridges of the capsule are only 8, with occasionally only a trace of the intermediate ones; the capsules are much exserted, cylindric, and longer than in *O. anomalum*. The leaves also have the walls of the lower cells thickened nodosely, and the perichætial leaves are 4 mm. long. The specimens were collected at Niagara Falls, and we have not seen this species from any other locality, though it may be looked for among those labelled *O. anomalum*, and has probably been mistaken for that species.

ORTHOTRICHUM CUPULATUM, Hoff. Deutsch. fl. ii. 26 (1796).

O. strangulatum, P. Beauv. Prod. 81 (1805), fide Braithwaite.

O. strangulatum, Schwaegr. Suppl. I. ii. 53, t. 34 (1816).

I have not verified the synonymy of this species, though the types are probably at Geneva. *O. strangulatum*, Sull., of the Manual, however, is doubly debarred, as Venturi says it is the same as *O. Braunii*, Br. & Sch. As is well-known, *O. cupulatum* forms a marked group of closely allied forms or species, and hence has been variously treated by different authors. Braithwaite describes it as a polymorphous species with one variety, *nudum* (*O. nudum*, Dicks). Venturi recognizes *O. nudum* as a species, besides separating off *O. urnigerum*, Myrin, *O. Sardagna-*

num, Vent., and *O. Venturii*, DeNot. Limpricht recognizes six species in the Laubmoose, and Austin separated off *O. Porteri*, *O. Peckii* and *O. Lescurii*, the last of which was figured in Sullivant's Supplement to the Icones as var. *minus*, and referred with the other two to *O. cupulatum* as varieties.

Recently, in studying the genus, I came to the conclusion that Austin's view was more in accordance with modern methods, and seeing that Dr. Venturi had not seen specimens of Austin's species, I sent him authenticated specimens asking him for his opinion. In a letter dated the 11th of September, he says:

"I have at present at my disposal a set of Austin's Musci Appalachiani, and I find that the specimens of *O. Lescurii* and *O. Porteri* agree with those you have recently sent me and with the observations made in your letter. I find, however, in the packet containing *O. Porteri* another label belonging to *O. Peckii*, and being unable to distinguish the two forms, which perhaps are mixed in my specimen, I cited them as synonymns in the Muscologia Gallica. Recently, with the aid of your specimens, I have obtained a more positive notion of the characters of *O. Porteri*, which is not found in Europe. I am however still in doubt about *O. Peckii*, of which I have a morsel sent me by Lindberg from his set of the Musci Appalachiani. It may be that *O. Peckii* is simply a variety of *O. cupulatum*, but *O. Porteri* is in my opinion much more than a variety. The idea of a species is and always will be subjective and changeable according to the views of different authors. Now-a-days, when species are shaken and pulverized, as for example, *O. pallens* in Limpricht's Laubmoose, and *O. nudum* and *O. Sardagnanum* rank with *O. cupulatum*, we cannot without contradiction refuse to recognize *O. Porteri*. It is true that it has a distinct preperistome, but without the diagonal striations; and the teeth besides the longitudinal lines have their outer surface papillose. Of more importance and more conclusive in my opinion, is the elongated form of the capsule, which is occasionally almost cylindric, and the color of the ridges of the pericarp being an orange red instead of yellow. In several particulars *O. Porteri* is intermediate between *O. cupulatum* and *O. anomalum*, having the short truncate base of the capsule as in the former and the ovate-cylindric form and color of the capsule of the latter. Besides the hairs of the calyptra in *O. Porteri* are distinctly papillose and composed of 3–4 series of cells, whereas those of *O. anomalum*, if they exist at all, are almost simple. With *O. nudum* and *O. Sardagnanum*, it has no resemblance, as their distinctive character is the defluent neck of the capsule. I shall, therefore, uphold the autonomy of *O. Porteri*, leaving solely *O. Peckii* as a variety of *O. cupulatum*, as I have modified my opinion since I wrote the monograph for M. Husnot.

As for *O. Lescurii*, that also is in my opinion, an excellent species, even though the very small capsules have the form of the capsule of *O. cupulatum ;* for the ridges are always eight in *O. Lescurii*, and the peristome is papillose and without a preperistome, besides all the other characters which determine a species."

I do not agree with Dr. Venturi in referring *O. Peckii* as a variety to *O. cupulatum*, for it has only eight ridges to the capsule, which is also elongated as in *O. Porteri*, and it is to the latter species which it should be referred as a synonym, to which position Austin consigned it in his herbarium and in the BULLETIN (vi. 341, 1879).

ORTHOTRICHUM BRACHYTRICHUM, Schimper.

O. brachytrichum, Sch.; L. & J. Proc. Am. Acad. xiv. 140 (1879).

Drummonds Musci Americani, 157 pp. with *O. obtusifolium.*

Austin, Bull. Torr. Bot. Club, vii. 8 (1880). Macoun's Cat. 90 (1892).

We have been favored with a portion of the type of this species from Kew, and have also seen four sets of Drummond's mosses Dr. Torrey's, Sullivant's and those belonging to the Academy of Natural Sciences of Philadelphia, and the Geological Survey of Canada at Ottawa. In all except Sullivant's the specimens are all *O. obtusifolium*, but in his set they are mixed with *O. brachytrichum.* The type of the latter, though much resembling the former in its erect-appresssed leaves, bearing septate propagula, has the leaves acuminate, not obtuse, at apex, often erose or denticulate, occasionally cuspidate and hyaline like *O. diaphanum;* the margins are revolute and the cells faintly protuberant, not papillose; the stomata are immersed, not superficial, and the calyptra sparsely hairy. It differs from *O. diaphanum* in having only eight cilia, and the teeth are united in pairs (4-parted), not single.

In Austin's herbarium there is an autograph specimen from James, which is probably the one referred to in the BULLETIN (l. c.), labelled *O. obtusifolium*, Drummond's No. 157, on which Austin has written: "equals *O. brachytrichum*, Sch., of course it is *O. obtusifolium*," as undoubtedly it is, James having sent him only a part of Drummond's 157, and not the same as that he sent Schimper. The specimen of *O. obtusifolium* collected by Austin in Jordansville Swamp, New York, 1868, above referred to, has both acute and obtuse leaves on the same plants. These helped him, also, to confuse the two species.

Unequal Segmentation and Its Significance in the Primary Division of the Embryo of Ferns.

BY GEO. F. ATKINSON.

In studying the embryos of several species of the Polypodiaceæ, sections were obtained of the primary division which suggested the possibility of some fundamental law governing unequal segmentation of the egg, in some species at least. In finishing a camera lucida sketch of an embryo of *Pteris serrulata* I noted what at first was not observed, the two cells with their nuclei were of unequal size. Thinking some error might have arisen in connection with the first sketch the preparation was examined again, when it was easy to note the smaller size of the nucleus in the smaller anterior segment. Measurements with the micrometer showed that the diameter of the nucleus in the posterior segment was one-fourth to one-fifth greater than that of the anterior segment.

If this state of things were reasonably constant it would show a definite relation existing between the primary segmentation and the different functions of the two segments. That is to say, the nucleus of the egg first divides into two unequal nuclei, an anterior one smaller than a posterior one; that these unequal nuclei govern the size of the two primary segments of the embryo by which that part of the plant chiefly concerned in supplying nutriment, the root segment, is differentiated from that part chiefly concerned in the reproductive function, the stem segment. This is important from the fact that at the start the embryo is wholly dependent upon the prothallium for its nutriment.

The posterior segment, being the larger, presents a much greater absorbent surface over the prothallial tissue, and by subsequent growth and cell division more quickly reaches the extended surface characteristic of the foot in the early stage of the embryo.

For some time in the later divisions of the embryo, the tissue derived from the posterior segment exceeds in bulk that derived from the anterior segment. This is recognized as bearing a definite relation to the function of the different parts of the embryo. Why should not the impulse to this rational differentiation in the young tissues of the embryo exist in the egg and be manifested in the primary unequal division as seen in this example of *Pteris serrulata?* Another case was found in the embryo of *Adiantum cuneatum;* the anterior segment with its nucleus was smaller than that of the posterior segment. Goebel, Outlines of Classification and Special Morphology of Plants, p. 204, figures an embryo of *Adiantum Capillus-veneris* showing the anterior segment much smaller than the posterior segment. The nuclei are not shown, and he gives no explanation of the unequal size of the two segments. If the section were not perpendicular to the first division-wall, but oblique to it, the size of the cells might vary according to the focus plane of the microscope or the position of the section in the embryo. In the specimens of *Pteris serrulata* and *Adiantum cuneatum*, referred to above, it was especially noted that the primary division wall was perpendicular to the section. This added to the fact that the nuclei were unequal in size is conclusive that the stem segment was smaller than the root segment.

A few cases only would not be sufficient evidence to warrant the assumption that a general law of this nature exists, but it seems to me that it is sufficiently strong to warrant an enquiry as to its significance. It is desirable that an examination be made of a number of embryos showing the primary division, with a view to see how far this unequal segmentation will hold good. The fact that in the Polypodiaceæ the foot is much more highly developed than in the lower orders of ferns would seem to favor the possibility of there being a primary unequal segmentation of the embryo.

BOTANICAL DEPARTMENT,
CORNELL UNIVERSITY.

Two Perfectly Developed Embryos on a single Prothallium of Adiantum cuneatum.

BY GEO. F. ATKINSON.

It is well known that several archegonia on a single prothallium of the ferns may possess fertilized eggs. In some cases more than one of them is known to begin embryological development, but it is quite rare that more than one becomes a perfectly developed embryo capable of forming an independent plant. The statement is sometimes made that while several archegonia may possess fertilized eggs never more than one embryo is perfectly developed.

Heinricher,* in lighting prothallia both above and below, succeeded in causing the development of archegonia in numbers on both surfaces. In two cases two archegonia possessed fertilized eggs which developed into perfect embryos, one each above and below. This might be considered an abnormal condition induced from the peculiar condition of lighting.

Rauwenhoff † notes the development of two embryos on single prothallia of *Gleichenia*. In both of these cases, however, we are not informed of the comparative strength or advanced condition of growth of the embryos, so that it may be an open question whether both of the embryos on a single prothallium could have developed into independent plants.

Campbell ‡ also observes two embryos on a single prothallium of Osmunda, but states that one was far in advance of the other, and would probably have starved it out before the two could obtain foothold in the soil.

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* Heinricher, Beeinnflusst das licht die Organ Auflage am Farn Embryos, Mittheilungen des bot. Inst. zu Graz, Heft II., pp. 239–253.

† Rauwenhoff, De geslechtsgeneratie der Gleicheniaceen. Verh. d. Koninkl. Akad. van Wetensch. t. Amsterdam, 1889.

‡ Campbell, On the Prothallium and Embryo of *Osmunda Claytoniana* and O. *cinnamomea*, Ann. Bot. vi., 1892, 49–94.

In my studies of several species of the Polypodiaceæ I observed a prothallium of *Adiantum cuneatum* which showed two well developed cotyledons of apparently about the same age, and growing parallel to each other. Examining the specimen carefully it was noted that both cotyledons were attached to the under surface ot the prothallium side by side, and that by the base of each was a young leaf the tip of which was rolled up in circinate fashion. Two well developed roots also issued side by side a little to the rear of the cotyledons. The roots were long and well fastened to the substratum. These parts gave every appearance of there being two perfectly developed embryos that were in fact two independent plants from the same prothallium. A sketch was made of the prothallium with its two plants. It occurred to me that possibly this apparent development of two perfect embryos side by side on a single prothallium might be some abnormal condition of a single embryo in which the stem and root, or possibly the stem and root segment, had forked at a very early period in its developement. To be certain what the real condition of things was, the bulk of the cotyledons and roots was cut away and the prothallium with the young plants attached was cut in serial sections and mounted for examination. The sections were cut parallel with the axis of the prothallium and thus parallel with the embryo. From the point of passing in at one embryo to the issuing from the other all the sections were saved and arranged serially. A study showed two separate and perfect embryos, and they were so far advanced as to be able to exist independent of the prothallium.

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Botanical Notes.

Blephilia ciliata (*L.*) *Raf.*, *in Western New York.*—On July 2, 1893, I found a small tract of plants of *Blephilia ciliata* (L.) Raf., near Canandaigua, N. Y. The specimens grew in a low, rocky pasture adjoining a swamp. The plants were fine, being in full bloom at that time.

As nearly as I have been able to ascertain, *Blephilia ciliata* is one of the rare plants of New York. The range of Gray's Manual, Massachusetts to Minnesota, to be sure includes New York, but specific instances of its occurrence in the State are not forthcoming. It is not included in Dr. Torroy's Flora of New York, neither is it catalogued in Paine's "Plants of Oneida County and Vicinity," in the "Cayuga Flora," nor in the "Plants of Buffalo and Vicinity." Mr. David F. Day writes, that until the present instance, he never had heard of it as occurring in this State. It is mentioned in the preliminary catalogue of plants growing within one hundred miles of New York City, but the locality is not stated. Unless this last citation be based on a New York locality, I believe that the present is the first recorded instance of the occurrence of the species in New York State.

ELIAS T. DURAND.

ITHACA, N. Y.

Insular Vegetation.—To the list of plants seen in a very hasty visit made in 1885 to Great or South Duck Island, on the coast of Maine, published in the BULLETIN, xii. 103, I can now add the following species, seen in 1893:

Ranunculus acris, L.,
Arenaria lateriflora, L.,
Cerastium arvense, L.,
Montia fontana, L.,
Impatiens pallida, Nutt.,
Trifolium repens, L.,
Rubus strigosus, L.,
Potentilla Anserina, L.,
Drosera rotundifolia, L.,
Ligusticum Scoticum, L.,
Epilobium lineare, Muhl.,
Cornus Canadensis, L.,
Linnæa borealis, L.,
Galium trifidum, L. var. *pusillum*, Gray.,
Solidago ——— (immature),
Aster Radula, Ait.,
Prenanthes alba, L.,
Vaccinium macrocarpon, Ait.,
Menyanthes trifoliata, L.,
Veronica peregrina, L.,
Plantago decipiens, Barn.,
Polygonum aviculare, L.,
Myrica Gale, L.,
Sisyrinchium angustifolium, Mill.,
Smilacina trifolia (L.) Desf.,
Triglochin maritima, L.,
Ruppia maritima, L.,
Juncus Balticus, Deth. var. *littoralis*, Eng.,
Juncus bufonius, L.,
Juncus pelocarpus, E. Mey.,
Eleocharis ———
Scirpus maritimus, L.,
Festuca ———.

The species in Roman may be considered recent introductions. *Cerastium arvense*, L., was noticed many years ago by Mr. Edward L. Rand, upon the sheep-fed part of the island. *Cerastium viscosum* of the earlier list would now be called *C. vulgatum*, and the *Epilobium coloratum* of that list is now generally referred to E. *adenocaulon*, Haussk. The present list is probably not complete.

JOHN H. REDFIELD.

Montia fontana, L.—This diminutive Portulaceous plant, though widely distributed in the colder and temperate regions of both hemispheres, has not hitherto been noticed within the limits of our Atlantic States. It has been seen near Halifax, Nova Scotia, and Shediac, New Brunswick, and thence northerly.

On the 5th of July last it was detected by Mr. Edward L. Rand, near the eastern shore of Great Cranberry island, two miles south of Mt. Desert, Maine. Fresh from the study of Mr. Rand's specimens, I found it on the 17th of the same month, at two localities upon South Duck island, ten miles south of Mt. Desert. Careful search will doubtless reveal other localities on the Maine coast.

JOHN H. REDFIELD.

Su Alcune Briofite Fossili. U. Brizi (Bull. Soc. Bot. Ital. ii. 369–373, 1893). A list is given of twenty-four species of mosses, of which eighteen are still living near Rome; two are new, *Rhynchostegium orthophyllum* and *Dicranum Clericii.* From the variety of habitats of the different species, the author concludes that they must have collected in some slow stream and been imbedded there. They are so well preserved that even the cell structure of the leaves is visible.

E. G. B.

Solanum elæagnifolium, forma albiflorum.—Corolla white. I found six or seven plants of this pretty form at El Paso, Texas, growing close together—probably seedlings from one plant. The ordinary form of the species was abundant close by, but not mixed with the white-flowered ones. The color of the corolla in *Solanum* is well known to vary from violet or purple to white (as in the common potato), but it is interesting to notice how the white corolla may become a specific character (as in *S. nigrum*), in which case it rarely varies to purple. *S. nigrum* is one of the commonest plants in England, and I never saw one with the flowers other than white; yet Coulter (Bot. Rocky Mtn. Reg. p. 268) refers to a bluish form. Similarly, *S. triflorum*, which I found commonly in Colorado, had always white flowers in my experience, though in Rep. U. S. Dep. Agric. for 1888 it is said to have the flowers "white or pale blue."

T. D. A. COCKERELL.

LAS CRUCES, N. MEX. Aug. 27, 1893.

Reviews of Foreign Literature.

An Introduction to the Study of the Diatomaceæ. By Frederick Wm. Mills, F. R. M. S., author of Photography applied to the Microscope, with a Bibliography by Julian Deby, F. R. M. S. (London, Iliffe & Son, 3 St. Bede St., Ludgate Circus. Washington, D. C.: The Microscopical Publishing Co., 1893.)

This beautifully printed book is somewhat of a disappointment to the reviewer, and were it not for the extensive bibliography it would be a "twice told tale," and to us not as well told as it could have been. True it is, that in an "Introduction" an author is not supposed to write a monograph upon the subject, yet we feel that the description of what diatoms are, their habitats and their physiological properties is told in a very cursory manner, and hardly full enough for the beginner to get a real knowledge of the plants. We much prefer other articles upon the subject, both for logical arrangement, completeness and lucidity.

The individual chapters upon Structure, Modes of Reproduction, Collecting and Mounting are too brief, and we cannot but feel that the "Introduction" compares very unfavorably with the "Bibliography," which of itself makes the book of paramount value; such a book that no worker in the diatoms can get along without, and one that will prove of inestimable stimulation to the amateur.*

The paper, printing and binding are especially commendable, and the book is well worth the price asked for it. S. E. J.

Index to Recent Literature Relating to American Botany.

Additions to the Preliminary List of the Uredineæ of Ohio. Freda Detmers (Bull. Ohio Agric. Ex. Sta. i. 171).

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* We note, however, many gaps in this Bibliography, especially in the numerous papers of the later years.

Æchmæa Henningsiana, Wittm. und Bilbergia Schimperiana Wittm. Fritz Müller (Ber. deutsch. Bot. Gesell. xi. 364–366).

Agave Antillarum, Desc. O. G. Petersen (Bot. Tidssk. xviii. 266–270; one plate).

Analytical Synopsis of the Groups of Fungi. W. A. Kellerman and Aug. D. Selby (Bull. Ohio Agric. Ex. Sta. i. 203).

Anatomie der Acanthaceengattungen Afromendoncia und Mendoncia. E. Gilg. (Ber. deutsch. Bot. Gesell. xi. 351–364; one plate.)

Aphyllon uniflorum at London, Ont. J. Alston Moffat (Ott. Nat. vii. 99).

A Reader in Botany. Part II. Flower and Fruit. Selected and adapted from well-known authors by Jane H. Newell (Boston, Ginn & Co., 1893, 179 pages, illustrated. Price sixty cents.

As in all her other books, Miss Newell has succeeded in making a very attractive little volume, without sacrificing scientific accuracy or methods. In fact we venture to think that some of the statements quoted from Miss Buckley's Short History of Natural Science would have been better made by the author, or omitted.

To those who have not had the time nor patience to study Darwin's and Müller's work on the Fertilization of Flowers by insects, and are not acquainted with Sprengel's, these chapters will serve as a pleasant introduction, and prove an incentive to further observation and study. The illustrations are all good, and the scientific names are given in nearly all cases.

Bacillus of Cheese—An Aromatic. L. H. Pammel (Iowa Agric. Coll. Ex. Sta., Bull. No. 12, 792).

Bacillus aromaticus, n. sp. is described and figured.

Bibliography of Ohio Botany. W. A. Kellerman (Bull. Ohio Agric. Ex. Sta. i. 180):

Botany at the World's Fair. J. C. Arthur (Bot. Gaz. xviii. 357–364).

Botanical Notes from Texas. E. N. Plank (Gard. and For. vi. 392).

California Flora—Southern Extension of. T. S. Brandegee (Zoë, iv. 199, reprint).

New plants described are *Lupinus pallidus* and *Madia valida. Perityle rotundifolia* (Benth.) is concluded to be the rightful name of the plant that has been variously known as *Amauria rotundi-*

folia, Benth., *Perityle Fitchii*, Torr., and *Laphamia peninsularis*, Greene.

Californian Herb-lore—I. Ida M. Blochman (Erythea, i. 190, 191).
Notes on *Perezia microcephala* and *Trichostema lanatum.*

Carex flava, L. og Carex Œderi, Ehrh. O. Gelert (Bot. Tidssk. xviii. 271, 272).

Contributions a la Flore du Paraguay—Piperacees. C. De Candolle (Mem. Soc. Phys. Hist. Nat. Genéve, xxxii. No. 2).

Eight species of the genus *Piper* are enumerated, of which *P. cinerascens* and *P. fulvescens* are new. Nine species of the genus *Peperomia* are described, one of which *P. psilostachya*, is new. Plates are given of the new species.

Distribution of some Forest-trees in the Southern States—The. Chas. Mohr (Gard. and For. vi. 372).
Notes on *Hicoria myristicæformis*, *H. Pecan* and *Quercus Durandi.*

Distribution of some Western Plants—On the.—I. Edw. L. Greene (Erythea, i. 181–184).

Notes on species of *Lepidium*, *Matricaria discoidea* and *Madia sativa.*

Early scientific Expeditions to California—I. Willis L. Jepson (Erythea, i. 185–190).

Mr. Jepson has here given us a valuable and readable account of the first scientific expedition which visited California—that of the French explorer, La Peyrouse, who touched at Monterey with two frigates in 1786, five years before the visit of the Spanish explorer, Malaspina, with whom came the botanists Hænke and Nee.

Erythrea Centaurium. C. J. S. Bethune (Ott. Nat. vii. 99).
Record of its occurrence at Roach's Point, Lake Simcoe, Ont.

Evolution and Classification. Chas. E. Bessey (Bot. Gaz. xviii. 329–333).

Abstract of Vice-Presidential address before the Section of Botany, A. A. A. S., Madison meeting, August, 1893.

Examination of Glyptodendron, Claypole, and of other so-called Silurian Land Plants from Ohio. Aug. F. Foerste (Am. Geol. xii. 133–141, Pl. VII.).

An analysis of the species *Glyptodendron Eatonense*, Claypole, originally thought to be a plant and described as such. Comparison with other similar specimens has convinced the author that it is not a plant but a cephalopod, he therefore places this and *G. subcompressum*, Beecher, in the sub-genus *Glyptodendron*, and takes them out of botany into the cephalopod genus *Cyrtoceros*.

He also expresses the opinion that other supposed land plants of the Cincinnati group, viz: *Protostigma sigillarioides*, *Psilophytum gracillinum* and *Sphenophyllum primævum*, described by Lesquereux, are not such. The first may be a fucoid, the second probably a *Dendrograptus*, and the third probably some inorganic marking. A. H.

Flora of Madison and Vicinity; a preliminary Paper on the Flora of Dane County, Wisconsin. L. S. Cheney and R. H. True (Trans. Wisc. Acad. ix. 45–135; reprinted).

This is an interesting list of 900 species of plants, with localities and habitats, observed and collected mainly by the authors. A feature of the work is the indication of the officinal and non-officinal medicinal species. Specimens illustrating the catalogue have been deposited in the herbarium of the University of Wisconsin.

Flora of Ohio—New Plants for the. Wm. C. Werner (Bull. Ohio Agric. Ex. Sta. i. 235).

Flora of the Bouldin Island. Katharine Brandegee (Zoë, iv. 211, reprint).

Flora of the Niagara Peninsula and Shores of Lake Erie—Notes on the. John Macoun (Journ. and Proc. Hamilton Ass. ix. 78).

Two species new to Canada are noted, *Hemicarpha subsquarrosa* and *Fimbristylis capillaris*.

Flowering Plants of Jamaica—A Provisional List of the Indigenous and Naturalized. William Fawcett (Kingston, 1893).

Folk-lore of Plants—The. Carrie M. Derick (Can. Rec. Sci. v. 332–339).

Hemlock in Minnesota. H. B. Ayres (Gard. and For. vi. 418).

Ilex conocarpa, Reiss. J. D. Hooker (Bot. Mag. t. 7310).

Native of Brazil.

Krugia, eine neuer Myrtaceengattung. I. Urban (Ber. deutsch. Bot. Gesell. xi. 375–376).

Based on *Marliera elliptica*, Griseb, from Trinidad and St. Vincent.

Leguminosæ—The Morphology of Root-tubercles of. Albert Schneider (Am. Nat. xxvii. 782; illustrated).

Mamillaria rigidispina, Hildman (Monats. Kakteenk. iii. 111–114; one figure).

Notes on Distribution of and Stations for a few Rare and Interesting Ohio Plants. Wm. C. Werner (Bull. Ohio Agric. Ex. Sta. i. 232.

Notes on the Flora of Long Island. S. E. Jelliffe (Science, xxii. 6).

The author gives a condensed account of what has been written upon the flora of Long Island, the number of species which have been identified, and calls attention to some of the most interesting ones. Reference is also made to the geological features and their probable influence upon the floral distribution.

Nymphæa tuberosa. (Gard. and For. vi. 415).

Ohio Plants—Notes on rare. Aug. D. Selby (Bull. Ohio Agric. Exper. Sta. i. 241).

Persimmon—The. J. T. Rothrock (Forest Leaves, iv. 72, with illustrations of *Diospyros Virginiana.*

Philosophy of Flower Seasons—The. Henry L. Clarke (Am. Nat. xxvii. 769).

Plants of Ohio—New or Rare. W. A. Kellerman (Bull. Ohio Agric. Ex. Sta. i. 241).

Rape Plant—The. Thomas Shaw (U. S. Depart. Agric. Farmers' Bull. No. 11). With illustrations.

Redwood in the Oakland Hills—The. Wm. P. Gibbons (Erythea, i. 161–166).

An account of the isolated forest of *Sequoia sempervirens*, which occurs back of San Francisco Bay.

Rhodochiton volubile. (Garden, xliv. 8, with colored plate.)

Saccaromyces—The Spore-Forming Species of the Genus. J. Christian Bay (Am. Nat. xxvii. 685, reprint).

Scitamineæ nonnullæ novæ vel minus cognitæ. O. G. Petersen (Bot. Tidssk. xviii. 260–265; three plates).

Costus Friedrichsenii, n. sp., habitat unknown, *C. Mexicanus* Liebm. ined. of Mexico and *Ischnosiphon pruinosus*, n. sp., habitat unknown, are characterized and illustrated.

Sequoia gigantea—Native Habits of. Gustav Eisen (Zoë, iv. 141–144).

Sierra Nevada Plants in the Coast Range. Katherine Brandegee (Zoë, iv. 168–176).

Record of the occurrence of 95 species and varieties.

Solidago petiolaris (Meehan's Month. iii. 129).

Southwestern Plant Groups—A Characteristic. Henry Clarke (Pop. Sci. Month. xliii. 786).

Illustrations are given of species of *Opuntia*, *Cereus*, *Yucca* and *Agave*.

Systematic and Alphabetical Index to New Species of North American Phanerogams and Pteridophytes published in 1892. Josephine A. Clark (Contr. U. S. Nat. Herbarium, i. 233).

Tennessee Plants—Some new. S. M. Bain (Asa Gray Bulletin, No. 2, 10).

Record of 18 species, additional to Dr. Gattinger's Flora of the State.

Tipularia discolor. H. C. Beardslee (Asa Gray Bulletin, No. 2, 11, 12).

Tubercules d'Apios tuberosa et d'Helianthus tuberosus—Observations anatomiques sur les. Paul Nypels (Bull. Soc. Bot. Belg. xxxi. 216–230; three plates).

Teratological Notes. J. Burtt Davy (Erythea, i. 192–193).

Observations on *Leptosyne gigantea*, *Agoseris hirsuta* and *Salvia Columbariæ*.

The Violet. O. R. Willis (New York Military Academy Quarterly, iv. 4–6; six figures).

Description of the native violets about Cornwall, N. Y.; several new forms are proposed.

Tonina fluviatilis Aubl. V. A. Poulsen (Bot. Tidssk. xviii. 279–292; two plates).

A morphological and anatomical study.

Vegetable Pathology for 1892—Report of the Chief of the Division of. B. T. Galloway (U. S. Depart. Agric., 1893, illustrated).

Vegetation of the Summit of Mt. Diablo. Edw. L. Greene (Erythea, i. 166–179).

A list of 156 species. *Agoseris intermedia* is described as new, and *Malvastrum Fremonti* is transferred to *Malveopsis*.

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Vol. XX. NOVEMBER, 1893. No. 11.

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BULLETIN
OF THE
TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., November 15, 1893. No. 11.

Notes on Carex.—XVII.

By L. H. Bailey.

The most important recent extensions of the ranges of the carices are the finding of *Carex Assiniboinensis*, W. Boott, in Northern Minnesota, by F. F. Wood, and *C. alpina*, at Grand Marais, Minn., on Lake Superior; *C. torta*, in Washington county, Eastern Missouri, by H. Eggert; *C. capillaris*, on Mt. Kineo, Moosehead Lake, Maine, by Dr. G. G. Kennedy, and in Aroostook county, by M. L. Fernald. *Carex Assiniboinensis* is new to the United States, having been known heretofore only from the collections of Macoun in British America.

✓ CAREX VERNACULA.

C. fœtida, American authors, not Allioni.

Distinguished from *C. fœtida*, its European congener, by stiffer and shorter leaves, shorter spikes, which give the head a more regular and compact look, and especially by much larger and broader and more or less prominently nerved perigynia.

This species, which is yet imperfectly known, inhabits the mountains from Colorado and Wyoming westward.

✓ CAREX FETA.

C. straminea, var. *mixta*, Bailey, Proc. Amer. Acad. Arts and Sci. xxii. 151 (1886), not *C. mixta*, Raeusch.

The Pacific coast representative of *C. albolutescens* (*C. straminea*, var. *fœnea*), from which it differs in its much slenderer habit, more open and long heads, smaller spikes and perigynia. The perigynia are loosely placed in the spike, giving the plant much the appearance of forms of *C. straminea* and *C. fœnea.* In the Botany of California it is variously referred to *C. lagopodioides*, *C. adusta*, *C. cristata*, var. *mirabilis*, and *C. scoparia*, var. *fulva.*

Carex lurida, var. PARVULA (Paine).

C. tentaculata, var. *parvula*, Paine, Cat. Oneida Pl. 105 (1865).

Low (8′ to 16′), very slender, with one or two spikes which are half or less the size of those in the type, sessile or very nearly so perigynia not more than half the size of those in the common form. A diminutive form growing along the Mohawk River, according to Paine; I have also collected it in Southern Vermont, and Professor Hitchcock sends it from Ames, Iowa.

Carex intumescens, Rudge, var. FERNALDII.

Very slender (about a foot and a half high), with leaves narrower than in the type; spikes reduced to one to three perigynia, which are erect and slender, being inflated less than half as much as those in the type.—Cedar Swamp, Aroostook county, Maine, 1893. M. L. Fernald, 127.

Forms of *C. intumescens* sometimes occur in dry woods, in which the spikes are reduced to one or two perigynia; but this variety differs in the slender perigynia which stand erect in the spike.

Carex debilis, Michx., var. INTERJECTA.

C. debilis Sartw. Exsicc. No. 118 (1848).

C. debilis β Boott, Ill. t. 273 (1860).

Tall and nearly or quite strict, with nearly erect spikes which are often compound at the base, very loosely flowered; perigynium shorter than in the var. *Rudgei,* the beak conspicuously less cylindrical. It differs from the var. *strictior* in the much narrower leaves and more loosely flowered spikes. Sartwell collected it at Penn Yan, N. Y., and Boott reports it from Pennsylvania by Townsend. Mr. C. L. Shear sends me specimens from Alcove, eastern New York, which is the first undoubted material I have obtained to match Boott's excellent plate and Sartwell's specimens. I do not know what its range may be. Undoubtedly various intermediate erect-spiked forms, which have always been a puzzling part of *Carex debilis* will need to be referred here. The erect alternate-flowered spikes and short perigynia distinguish it from the common var. *Rudgei.*

Carex granularis, Muhl., var. RECTA, Dewey, Wood's Cl. Book, 1860, 763.

A very tall slender plant, with narrow erect leaves, narrow spikes, of which the lower are on very long and slender stalks; pergynium less inflated than in the type and straighter. Glaucous. Dewey records it from Southern Illinois (Vasey) and Louisiana (Hale). I have it from Virginia, Southern Illinois, the mountains of Georgia, and Mississippi. It is a well-marked form. No one seems to have taken up the variety except Paine, in his Catalogue of Oneida plants (1865); but Paine must have misunderstood it, for I do not know that it occurs in the North.

CAREX GRACILLIMA × ÆSTIVALIS?

Mr. C. L. Shear sends me from eastern New York, good specimens of a most distinct and novel carex. He first found the plant last year (1892), in a moist meadow at Alcove, Albany county. A single clump only was observed, and it grew with *C. gracillima.* In 1893 Mr. Shear found it again at two places in Greene county—between Windham and Ashland, and at Hunter—growing in clumps in mountain pastures. The plant differs visibly from *C. gracillima* in its much stricter habit, narrow leaves, nearly erect spikes, and by the distinctly beaked and toothed perigynium. Its association with *C. gracillima,* and the fact that it is uniformly wanting in good achenia, indicate that the plant is a hybrid. I am unable to determine what its other parent may be, but the fact that the perigynia are attenuated at the top, that the leaves are narrowed, the lower sheaths slightly pubescent, and the habit essentially erect, strongly suggest *C. æstivalis,* and this species occurs on the mountains of western Massachusetts and in eastern New York. I suspect that further search will discover *C. æstivalis* in the mountain pastures of Albany and Greene counties. It is by no means necessary to the diagnosis of a hybrid that both parents be found in its vicinity. One parent, or even both of them, may long since have died out and the hybrid may have persisted; yet the hybrid is usually associated with its pistillate parent. I have found undoubted hybrids of Rubus in localities where but one parent could be formed. Nor is it strange that a hybrid should be found to have a somewhat wide distribution. *Carex arctata* × *castanea* (*C. Knieskernii*) occurs in New York, Minnesota and upon the Canadian side of Lake Superior; and I may add that *C. gracillima* × *hirsuta* was found at an early day, according to Dewey (Sill. Journ. xi. 315), at Newburgh, New York, and at Stockbridge, Mass., although it has been recorded by Torrey and subsequent writers as having been collected only at Phillipstown, near the Hudson. It is strange, however, if *C. æstivalis* is the missing parent of this beautiful carex, that the beak should be bifid, for both *C. gracillima* and *C. æstivalis* have entire orifices.

This is the third hybrid which seems to have had *Carex gracillima* for its mother. It is interesting to note, also, that this species often develops its perigynia apparently without the aid of pollination.

CAREX ÆSTIVALIS, while one of our rarer Carices, has received a variety of names. Its first name was *Carex Darlingtonii* given by Schweinitz, but the name was not published until Dr. Boott recorded it, as a synonym, in 1858. The original of this is now in the possession of the Philadelphia Academy of Sciences, and the ticket, in Schweinitz's hand, says that Darlington collected the plant upon the Pocono Mountains of northern Pennsylvania. M. A. Curtis also gave it the name *Carex tabularia* in his herbarium, and this name was also published as a synonym by Boott. A specimen bearing this name, and coming from Boott, is in the Torrey Herbarium. Kunze called the plant *Carex Rugeliana* in his "Supplemente zu Schkuhr's Riedgräsern," which was published at intervals from 1840 to 1850. I am not sure of the date of this name, but it is held to be later than Curtis' *Carex æstivalis*, which Dr. Gray published in 1842. Finally, Olney, in his Exsiccatæ, 1871, made it a variety of *Carex virescens*, with which it has no immediate affinity. The affinity of the plant is with *Carex gracillima*, of which John Carey thought, "if not distinct, it is a mountain form." Dewey confounded it with *Carex arctata* and *Carex sylvatica*. But it is abundantly distinct. Its northernmost station is Saddle Mountain, in western Massachusetts, where Dewey found it in 1828, at 800 feet above the base of the mountain.

THE STRAMINEA GROUP:

Willdenow described, in 1809, the plant which has long been known as *Carex adusta*, under the name of *C. fœnea*. The description was not understood, however, and Torrey, in 1836, applied Willdenow's name to the plant which is now known as *C. straminea*, var. *fœnea*. These two *fœneas* now stand, applied to plants very like each other, and the circumstance is confusing. I shall, therefore, find some other name for the *C. straminea* var. *fœnea* of Torrey, especially as I believe the plant merits specific distinction. It was first described by Schweinitz in 1824, as *Carex albolutescens*, and this name I now restore. Unfortunately, Olney misunderstood Schweinitz's plant and thought it to be the *C. adusta* of our manuals. I have seen Schweinitz's original, and it is clearly Torrey's *fœnea*. There are forms which are somewhat intermediate between *Carex straminea* and *C. albolutescens*, but one who is familiar with the two species can easily place them. But I separate them in order to allow of a philosophical presentation of *C. straminea* and its varieties. This species, as heretofore constituted, includes two coördinate branches or type, the stramineous or straw-colored and the albolutescent or silvery green type. If these types are considered to be coördinate varieties, it is impossible to recognize several minor forms, which appear to be worthy varietial recognition, unless resort is taken to the European fashion of sub-varieties. By removing the albolutescent type, I am able to separate some of the well-marked forms which now confuse *C. straminea* var. *brevior* into coördinate varieties. The forms which I desire to remove from it are:

Carex straminea, var. FERRUGINEA (Gray).
C. fœnca, var. β Boott. Ill. 118, t. 376 (1862).
C. fœnea, var.? *ferruginea*, Gray Man. 5th ed. 580 (1867).
C. tenera, var. *suberecta*, Olney, Exsicc. fasc. ii. No. 16 (1871).

Plant very tall and slender, with two or three pointed or long-ovate, rusty-green spikes approximate at the top. The spikes are usually prominently tapering below, and the thin, nearly nerveless perigynia have loose points. That has somewhat the look of some forms of *C. scoparia*, but is always readily distinguished by its separated spikes and *straminea*-like perigynia. I know it only from Ohio and Illinois, but it must have a wider range.

C. straminea, var. Crawei, Boott, Ill. 121, t. 388 (1862).

C. straminea, var. *Meadii*, Boott, l. c. t. 389.

Robust forms with very large heads and mostly round, loose spikes, with very broad, long-pointed perigynia, which easily shell off when ripe. From Connecticut and New Jersey to Illinois; evidently more common westward.

Carex albolutescens, Schw. Ann. N. Y. Lyc. i. 66 (1824).

C. straminea, var. *fœnea*, Torr. Monogr. 395 (1836), not *C. fœnea*, Willd. (1809).

C. straminea, var. β Gay, Ann. Sci. Nat. 2d ser. x. 362 (1838).

C. leporina, var. *bracteata*, Liebm. Mex. Halv. 264 (1850).

C. straminea, var. *chlorostachys*, Bœckl. Linnæa, xxxix. 118 (1875).

✓ Var. cumulata (Bailey).

C. alata, var. *pulchra*, Olney (mostly), Exsicc. fasc. ii. No. 23 (1871).

C. straminea, var. *cumulata*, Bailey, Mem. Torr. Bot. Club, i. 23 (1889).

Carex echinata, and its American congeners:

The American plants which have been variously known as *Carex echinata*, *Carex stellulata*, *Carex sterilis* and *Carex scirpoides* have been the subject of more neglect than any other American carex, perhaps more, even, than any other of the older species of our flowering plants. This lack of attention is due both to the polymorphous character of the species and to the uncertainty of a specific identification with the European plant. Every collector must have noticed that all printed descriptions of the species are singularly unsatisfactory, and that widely different forms are thrown loosely under one name. The species is not an attractive one at best. I have long felt that the plant has never been understood, and for two or three years I have made a special effort to collect material for study. The arrangement of this material, which I now propose, seems to solve the difficulties which have always attached to the species. The solution of the perplexities turns upon two questions:

1. Is the American plant identical with the European? Over thirty years ago Francis Boott questioned if the American plant is the same as the European *C. stellulata* (or *C. echinata*), but no monographer since Muhlenberg seems to have eliminated the European species from our flora. The plants of the two continents are exceedingly similar, and yet there is a facial difference between them which is nearly always apparent and often striking. Definite specific characters of separation are obscure, and yet I am convinced that they exist. The American plant is habitually taller than the European, the scales are sharper and usually longer, the perigynia are more strongly nerved and more attenuated or conical, and, above all, it is far more variable. The history of American *Carex* literature is a continuous record of the separation of American and European types. There are probably no species common to both countries, except those which are hyperboreal and occur through the Arctic regions of both hemispheres, being found in Greenland. There are other supposed identical species, aside from *Carex echinata*, which, I think, will eventually be separated in the two continents. I am satisfied that the American species under consideration can never be properly understood until it is treated independently of the European plant.

2. Is the American species monotypic? Any acute observer would at once see that our so-called *Carex echinata* contains two distinct general types, if the specimens were spread before him; and, fortunately, these facial attributes are reinforced by excellent specific characters. One type, to which the *Carex sterilis* of Willdenow and the *C. scirpoides* of Schkuhr belong, is characterized by distinctly long-beaked spreading or ascending winged perigynia, and loose, bushy yellowish spikes; the other, which has no name, is marked by very short-beaked, small and nearly wingless perigynia, which are spongy and more or less cordate at the base and which shell off upon the sheet, and by more rounded or cylindrical greenish spikes—the terminal one often oblique—in which the perigynia are strongly divaricate or often bent downwards. And aside from these, the stiff and wide-fruited sea-board plant—known as var. *conferta*—will be seen to have ample specific characters. I have, therefore, outlined three species from the material

heretofore thrown loosely into *Carex echinata*. This, I hope, will be better than detailing a mere list of varieties which should have no coherence, and which should differ from each other in the very terms by which the species is distinguished from its fellows. These plants may be outlined as follows:

CAREX STERILIS, Willd. Sp. Pl. iv. 208 (1805). Sartwell Exsicc. No. 37. Boott. Ill. t. 146.

C. scirpoides, Schkuhr, Riedgr. Nachtr. 19, fig. 180 (1806).

C. stellulata, vars. *scirpoides* and *sterilis*, Carey, Gray's Man. 1848, 544.

C. echinata, var. *microstachys*, Boeckl. Linnæa, xxxix. 125 (1875).

C. echinata, var. *microstachya*, Boeckl. Flora, 1875, 563.

C. echinata, var. *microcarpa*, Bailey, Coulter's Rocky Mt. Bot. 395 (1885).

Short, stiff and erect (usually not much exceeding a foot in height), the old leaves often persistent; head tawny or greenish-yellow, short, composed of from three to five small loosish contiguous spikes, of which the uppermost is usually conspicuously attenuated at the base by the presence of staminate flowers; sometimes the terminal spike or even the whole head is entirely staminate; perigynium thin and flat, conspicuously contracted into a slender beak which is nearly or quite as long as the body and spreading so as to give the spike an echinate appearance, sharp-edged and rough on the upper margins, variously nerved and very sharply toothed.—A common plant, growing in dryish bogs and swales throughout the Northern States east of the Mississippi; and I also have it from Willow Springs, Arizona (*Palmer*, 548), and Mt. Adams, Oregon (*Henderson*). The plants of Willdenow and Schkuhr seem to have been variously understood by successive botanists, although the figures of both *C. sterilis* (fig. 146) and *C. scirpoides* (fig. 180) in Schkuhr's "Riedgräser" are unequivocal. I have also seen the originals of both plants. The dioeciousness of the species seem to be only an occasional state, and as I have not been able to discover other characters which uniformly accompany it, I have thrown *C. sterilis* and *C. scirpoides* together.

✓Var. EXCELSIOR.

C. stellulata and *C. echinata*, American authors. Sartwell, Exsicc. no. 35.

C. sterilis β Boott, Ill. 56, t. 146* (1858).

Taller and more slender (often two feet high), the heads usually more scattered and mostly somewhat greener.—Common in wet bogs and woods, apparently in all the Northern States; occurs also in Louisiana, Mexico, and in Oregon and Vancouver Island.

Var. CEPHALANTHA (Bailey).

C. echinata, var. *cephalantha*, Bailey, Mem. Torr. Bot. Club, i. 58 (1889).

Rather stiff but slender and tall, or the top of the culm weak (1–2 feet high); head mostly continuous or more or less dense and composed of five to eight approximate (rarely scattered), large (15–30 flowered) green or greenish loose spikes, in which the mature narrow, long-beaked perigynia usually spread at nearly or quite right angles.—Runs across the country from the northern borders of the United States northward, from the Atlantic to the Pacific, reaching as far south as the higher elevations in northeastern Pennsylvania. There are two forms in this, one (the type) marked by aggregated spikes, and one by more or less scattered spikes. The latter may be worth varietal recognition.

Var. ANGUSTATA (Carey).

C. stellulata, var. *angustata*, Carey, Gray's Man. 1848, 544.

C. echinata, var. *angustata*, Bailey, Mem. Torr. Bot. Club, i. 59 (1889).

Very slender, sometimes almost thread-like, weak, bearing long and narrow divaricate perigynia, which are either in loose small heads or in scattered spikes.—New England to Newfoundland. Apparently also in Montana.

CAREX ATLANTICA.

C. stellulata, var. *conferta*, Chapm. Fl. S. States, 534 (1860), not *C. conferta*, Koch.

C. echinata, var. *conferta*, Bailey, Carex Cat. (1884).

Tall (16 to 24 inches) and very stiff and strong, the leaves broad but stiff and usually becoming somewhat involute when dry; spikes contiguous or scattered, spreading, globular or short-cylindrical, densely flowered, green; the terminal one slenderly contracted below or even entirely staminate; perigynium large and very broad (the body about as broad as long), with a distinct rough, bifid beak, strongly many-nerved, especially upon the back, squarrose or usually retrorse at maturity, shelling off readily when ripe.—Follows the coast from Newfoundland to Florida; not common. It is strange that none of the earlier students of the genus discovered this distinct plant.

CAREX INTERIOR.

C. scirpoides, Sartwell, Exsicc. No. 36 (1848). *C. stellulata*, var. *scirpoides*, Boott, Ill. t. 146** (1858).

Very slender, but mostly strict (1–2 feet high), the thin wire-like culms usually longer than the narrow and rather soft grass-like leaves; head composed of two to four little globular contiguous greenish-tawny spikes, of which the terminal one is usually slenderly contracted or stipe-like below and often oblique; perigynium very small and plump, the margins very narrow or almost none, lightly many nerved on the back, but usually nerveless or nearly so on the face, prominently corky at the base, the beak and the teeth very short, spreading or reflexed at maturity and easily shelling off.—Bogs and swamps, in the interior country, from Maine to Minnesota and Kansas. When this plant is once understood, I am sure that its identity cannot be mistaken. The utter confusion in which our *Carex echinata* has always lain, must be the only reason why the plant was not separated long ago. Boott knew that it is distinct from *C. sterilis*, but he made the mistake of trying to identify it with Schkuhr's *C. scirpoides*. But Schkuhr's plant, as his plate plainly shows, was a short, stiff, fulvous plant with oblong spikes and long-beaked broad-winged perigynia.

VAR. CAPILLACEA.

Still more slender or even bristle-like in both culm and leaves, and habitually lower (sometimes 16 inches, but often only half as high); perigynium more cordate at the base and broader, strongly many-nerved upon both sides.— Eastern Massachusetts, New Jersey and Central Pennsylvania. Perhaps specifically distinct from the last. My attention was first called to this plant some years ago by the late William Boott, who was once inclined, I think, to publish it.

HOMONYMOUS NAMES.

The Committee on Nomenclature of the Botanical Club adopted, at Rochester, an article which declares that "the publication of a generic name or a binomial invalidates the use of the same name for any subsequently published genus or species, respectively." This rule, I am instructed, is to be enforced rigidly in the forthcoming Check List to be issued officially by the Club. The committee has also decided, by a recent vote upon *Carex Michauxiana* and *C. Michauxii* as a test case, that proper names differing only in their terminations are homonymous. It is with much regret and hesitation that I apply this rule to the carices of the Check List, although I fully sympathize with it. While the necessary changes are not numerous, they involve some of our best known species. The innovations which follow as a direct or indirect result of the homonymy of the Check List are as follows:

✓ Carex abacta.

C. rostrata, Michx. Fl. Bor. Am. ii. 173 (1803), not Stokes in With. Arrang. Brit. Pl. 2d ed. 1059 (1787).

C. xanthophysa, vars. *nana* and *minor*, Dewey, Sill. Journ. xiii. 353, figs. 57, 58 (1828), not *C. nana* Lam., nor Cham. nor Boott; *minor* has been frequently used in the genus.

C. Michauxiana, Bœckl. Linnæa, xli. 336 (1877), not *C. Michauxii*, Schw. (1824), nor Dewey (1826).

Carex abbreviata, Schw. in herb.; Boott. Linn. Trans. xx. 141 (1846); Ill. 21 (1858). *C. Torreyi*, Tuckm. Enum. Meth. 21 (1843), not *C. Torreyana*, Schw. (1824), nor Dewey (1826).

Boott originally attributed the herbarium name *abbreviata* to Prescott, but it was really Schweinitz's, and the error is corrected in Boott's Illustrations, i. p. 21.

✓ Carex Asa-Grayi.

C. intumescens, var. *globularis*, Gray, Ann. N. Y. Lyc. iii. 236 (1834), not *C. globularis*, Linn.

C. Grayii, Carey, Sill. Journ. 2d ser. iv. 22 (1847), not *C. Grayana*, Dewey (1834).

✓ Var. hispidula (Gray).

C. Grayii, var. *hispidula*, Gray in herb.; Bailey, Mem. Torr. Bot. Club, i. 54 (1889).

CAREX AUSTRO-CAROLINIANA.

C. Caroliniana, Buckley, Sill. Journ. xlv. 173 (1843), not. Schw. (1824).

Table Mountain, South Carolina.

CAREX COLLINSII, Nutt. Gen. N. Am. Pl. ii. 205 (1818).

C. subulata, Michx. Fl. Bor.-Am. ii. 173 (1803), not Gmelin, Syst. ii. part i. 138 (1791), nor Schumch. Faell. i. 270 (1801), nor Wahl.

C. Michauxii, Dewey, Sill. Journ. x. 273 (1826).

CAREX DURIFOLIA.

C. Backii, Boott; Hook. Fl. Bor.-Am. ii. 210, t. 209 (1840), not *C. Backana*, Dewey (1836).

CAREX FRANKII, Kunth, Enum, Pl. ii. 498 (1837).

C. atherodes, Frank, Hb. Unio. Itin. (1835), not Sprengel (1826).

C. stenolepis, Torr. Monogr. 420 (1836), not Lessing, Reise durch Norwegen (1831).

So long ago as 1843 Kunze observed that Torrey's *C. stenolepis* is antedated by Lessing's, and Gray called attention to the fact in Silliman's Journal in 1844.

CAREX LOUISIANICA.

C. Halei, Carey, Chapm. Fl. S. States, 543 (1860), not Dewey (1846).

Florida to Louisiana and Texas and Arkansas.

CAREX MEMBRANOPACTA.

Carex compacta, R. Br. Ross's Voy. Append. cxliii. (1819), not Krock. Fl. Sil. iii. (1814).

Carex membranacea, Hook, Parry's 2nd. Voy. Append. 406 not Hoppe, Ic. 71.

Carex saxatilis, var. *compacta*, Dewey, Sill. Journ. xi. 321 (1826).

Arctic America.

CAREX QUALICUMENSIS.

C. Macounii, A. Bennett; Macoun, Cat. Can. Pl. iv. 147 (1888), not Dewey (1866).

C. salina, var? *robusta*, Bailey, Bot. Gaz. xiii. 87 (1888), not *C. robusta*, Hochst.

Grows in large patches between tides in the bed of Qualicum River, Vancouver Island.

Carex Walteriana.

C. striata, Michx. Fl. Bor. Am. ii. 174 (1803), not Gilib. Exerc. Phyt. ii. 550 (1792); Boott, Ill. t. 151 (1858).

Carolina to Florida. Now renamed in memory of Thomas Walter, author of Flora Caroliniana, 1788.

Var. brevis (Bailey).

C. striata, β Boott, Ill. 57 (1858).

C. striata, var. *brevis*, Mem. Torr. Bot. Club, i. 34 (1889).

New Jersey to North Carolina.

New Genera of Plants from Bolivia.

By H. H Rusby.

(Plates CLXVII.–CLXX.)

MALPIGHIACEÆ.

Of Bentham and Hooker's four tribes of Malpighiaceæ, my first genus differs from the first in its pyramidal torus; from the second in its non-climbing habit, and wingless fruits, combined with two-formed stamens and appendaged anthers; from the third by its wingless fruits and two-formed anthers, and from the fourth by its 10 stamens, those alternate with the petals being the defective ones. Its habit is certainly at agreement with the last tribe, and it would easily pass, without dissection, for a species of *Camarea;* but the androecium and general reproductive characters separate it widely therefrom. All things considered it appears most closely related to the first tribe, where I place it, making an exception as to its gynobase, between the genera *Acmanthera* and *Pterandra.*

BRITTONELLA.

Caylx ample, foliaceous, somewhat accresent, deeply 5-parted, 8-glandular, the glands ovoid and of medium size. Petals 5, on short claws, concave and incurved, the margins wavy and erose-dentate, in this species at least yellow. Stamens 10, sub-distinct, of 2 forms; those opposite the petals perfect, the filaments stout, dilated downward, glabrous, their anthers affixed at the outer base, partly deflexed, slightly winged at the base and appendaged with a small point; those alternating similarly formed, but much smaller and apparently imperfect, the anthers scarcely appendaged. Carpels 3, distinct, on a short pyramidal gynobase; ovary pilose, the apex slightly 3-dentate; style ventral, linear, truncate or the stigma slightly capitellate. Nuculæ 2 or even only 1, irregularly triangular-ovate, irregularly 3 cristate at the upper portion and corrugated. Seed (immature) ventrally affixed, ovoid, pointed. Perennial, fruticulose, sub-prostrate, hirsute, with opposite glandless leaves, and small, foliaceous stipules, similar to the leaves. Flowers solitary at the ends of the branches, peduncled.

Dedicated to my distinguished friend, Dr. Nathaniel L. Britton.

B. PILOSA. Suffruticulose, 5–10 cm. high, pilose throughout; root vertical, stout; branches ascending; stipules 2–3 mm. long, 1.5–2 mm. broad, ovate, very acute, foliaceous; petioles scarcely any; leaves .75–1.5 cm. long, .5–1 cm. broad, ovate, acute, the base rounded or subcordate, strongly veiny underneath; flowers about 5 mm. broad, the sepals 4 mm. long, oblong-ovate, the petals somewhat longer; fruit not mature.

Collected near Cochabamba by Mr. Miguel Bang (No. 935).

RUBIACEÆ.

Its numerous ovules, capsular fruit, solitary flowers, winged seeds, regular corolla, and embryo in albumen, fix my second genus in the Cinchoneæ. There being no proper bud I cannot be sure that the corolla is valvate, though it is apparently so. But the plant apparently has no affinity with any of the genera of the second section, with imbricate or convolute corolla, notwithstanding a certain similarity in habit with two of them. It therefore belongs in the Eucinchoneæ, in which, as shown by its loculicidal capsule and placentæ adnate to the middle of the septum, it is allied to a group of 8 genera, from each of which it is quite distinct in habit and structure. It is most nearly related to *Bouvardia*, and I place it between this and the little known genus *Heterophyllæa*.

LECANOSPERMA.

Calyx tube ovoid-campanulate, tuberculate, the limb 5-parted, the segments foliaceous and somewhat coriaceous, narrow. Corolla thick and tough, the tube elongated, very slender, the throat slightly dilated and the mouth again slightly contracted, villous within at the anther ring, the limb 5-lobed, the lobes ample, horizontally spreading or recurved. Stamens (dimorphous?) 5, filaments wanting, inserted into the base of the throat, the anthers included, linear oblong, dorsifixed, the base entire. Disk not prominent, fleshy; ovary 2-celled; style filiform, included or barely exserted, the branches 2, linear. Placentæ fixed along the central portion of the septum, the ovules rather numerous in the cells. Capsule globular, costate, the calyx limb imperfectly deciduous, crustaceo-cartilaginous, imperfectly loculicidal, the septum delicate, early separating from the walls to simulate a one-celled capsule. Seeds rather few, peltate, pendulous, imbricated in two ranks in each cell, circular, saucer-shaped, both as to the body of the seed and by the incurved wing. Embryo straight, in semi-corneous albumen, with well-developed caulicle and cotyledons.

A much branched ragged shrub (or tree?) with short spine-like leafy branchlets, the leaves minute, oblong-linear, semi-fleshy, crowded, the stipules obscure, somewhat sheathing:

Named in allusion to the striking saucer-shaped seeds.

L. LYCIOIDES. Bark gray, branches numerous, divergent, very unequal, rigid, leaves 3–5 mm. long, 1–2 mm. broad, on very short petioles, elliptical-oblong, entire, thickish, below granular, roughened, with prominent mid-rib, drying blackish; flowers (color?) terminal, solitary, peduncled; calyx 4 mm. long, the lobes 3 mm. long by .5 mm. broad, strap-shaped, slightly broadened upward, thickish, obtuse, the sinuses open; corolla nearly 2 cm. long, the tube very slender, the spreading limb nearly 1 cm. broad, the lobes broadly ovate, acutish; fruit pendulous on stout, very tough peduncles, globular, light-brown, 6 mm. in diameter, 10-costate; seeds nearly 3 mm. broad, hispid. Collected by Mr. Miguel Bang near Cochabamba (Nos. 1121 and 1122). Distributed as "Randia."

COMPOSITÆ.

My third genus has the homogamous, tubuliflorous heads, the sub-entire anther base, the sub-terete, obtuse, papillose style-branches, and the setose pappus of the 2d tribe, Eupatoriaceæ. Of its 3 sub-tribes, it has the appendaged anthers and the 5-angled akene of the Agerateæ. The pappus, entirely setaceous and of numerous setæ, exclude it from the 1st group of this sub-tribe. Between the 2d and 3d sections it is difficult to decide, as one of these is described as "*insigniter barbellata*," the other "*breviter barbellata*." On the whole, however, its affinities seem rather with the more strongly barbellate first section, notwithstanding that

Bentham relegated it to the second, as a species of *Eupatorium*. With none of the 6 genera of this first section does it agree. It appears to belong between (64) *Agrianthus* and (65) *Symphyopappus*, both Brazilian genera. Its most distinct characters are its spine-tipped involucral scales in 4 strictly vertical ranks, giving a perfectly regular quadrangularly prismatic involucre, and the very unequal rigid purple setæ of the pappus.

ADDISONIA.

Head homogamous, tubuliflorate and panciflorate. Involucre narrow, prismatic-quadrangular; scales about 12 to 14, in 4 vertical ranks, the outer successively shorter, the outermost very small, rigid, roughened, strongly keeled, produced into a spine-like tip. Receptacle naked, elevated and prominent as an irregularly and sharply angled body. Corollas equal, tubular, the limb campanulate, its border spreading, strongly 5-toothed. Anthers with obtuse triangular appendages and obtuse, nearly entire bases. Style-branches long, much exserted, obtuse, distinctly dilated upward, papillose. Achenia sharply 5-angled. Pappus wholly of setæ in a single series, easily detached altogether with the disc, 25–30, very unequal, rigid, stout, purple, moderately barbellate.

A tough (glutinous?) shrub, with elongated, appressed, erect-spreading branches; alternate, sessile, very small, linear spatulate, fleshy, papillose leaves, and heads solitary at the ends of abbreviated leafy branchlets, these crowded at the ends of the branches. The involucre, rigid, purple pappus and corolla characters are suggestive of *Stevia*, while the general habit is that of *Ageratella*. Specimens of the same plant, collected by Pearce, in the Kew herbarium are marked by Mr. Bentham "*Eupatorium*," but no species is named.

Genus dedicated to the honored President of the Torrey Botanical Club, Judge Addison Brown.

A. VIRGATA. Branches very slender, bright brown, slightly channelled, the internodes shorter than the leaves; leaves 5–12 mm. long, 1–2 mm. broad, linear-spatulate, below narrowed to a petiole-like base, obtusish, very thick, grayish-green, papillose with prominent broad midrib; heads virgately racemed and somewhat secund, at maturity 9 mm. long, 3–3.5 mm. broad. Involucre 6–7 mm. long by 3 mm. broad, regularly tapering to an acute base; the scales rigid, lanceolate boat-shaped, above keeled, with scarious spreading margins and pungently tapering apex, finely several-nerved, papillose; flowers about 5; corolla dull yellowish-white, 5 mm. long, 5-toothed, the teeth spreading, acutish; pappus bright purple, rather coarse, rigid, shortly barbellate, somewhat flexuose, very unequal, some of the setæ exceeding the corolla; achenia oblong with tapering base, 2 mm. long, brown, sharply ribbed. Collected in Southern Bolivia by Mr. Miguel Bang (No. 868). Perhaps distributed as "Chuquiragua."

VACCINIACEÆ.

A conclusion as to the generic rank of my fourth and last plant is not entirely free from doubt, but I cannot conscientiously describe it as a Vaccinium, the only genus which it resembles in structure. All generic divisions, both of the Vacciniaceæ and Ericaceæ are perhaps radically wrong. We have either far too many or far too few genera. If as I consider most probable, the present living members of these families represent a vastly greater number of extinct species, then the characteristics of the anthers constitute good generic characters, and many of our sub-genera may properly constitute monotypic or small genera. If on the other hand, these characteristics are trifling, there should be a considerable reduction of the genera. It is greatly to be desired that the paleontology of this group should be studied out.

From *Vaccinium* our plant differs in its absolutely solitary, many-bracted flowers, the pedicel continuous—not articulated—with the calyx, the calyx prismatic, and especially by the entire placentæ.

VACCINIOPSIS.

Calyx continuous with the pedicel, the tube turbinate, strongly 5-angled, the limb broadly campanulate, deeply 5-toothed. Corolla scarlet, contracted-campanulate, strongly 5-toothed, the teeth recurved, within lightly pilose. Stamens 10, not coherent, lightly adherent to the base of the corolla, equal and similar, the filaments longish, hirsute and incurved above. Anthers adnate, coarsely pilose, the cells obscurely muticous on the back, each abruptly contracted into a simple, straight, rigid beak which opens on the inner face by an elongated oblique pore. Disk conspicuous, elevated, cylindrical, 10-grooved with concave summit. Style stout, elongated, of uniform thickness, truncate. Ovary lightly 5-lobed, 5-celled, the placentæ 5, strictly simple, from the inner angles, fleshy. Ovules very numerous. Fruit not seen.

A (parasitical ?) shrub, with much elongated, simple, slender branches, alternate, nearly sessile, ovate, 3–5 nerved, fleshy, pale leaves, and solitary, nearly sessile, axillary flowers, the pedicel and calyx-tube clothed with broad, appressed, imbricated scales.

V. OVATA. Branches nearly parallel, 10–30 cm. long, 1–2 mm. thick, channelled, the bark gray or slightly reddish gray, glabrous, the internodes 2–8 mm. long. Petioles 1.5–2 mm. long, nearly as broad, flattened, minutely pubescent. Leaves 2–2.5 cm. long, 1–1.5 cm. broad, ovate or some nearly oval, entire, revolute, the base rounded or very slightly narrowed, the apex with an obscure blunt point, very thick, 2 pairs of strong lateral nerves from near the base, below smooth, above rugose-reticulated; flowers, inclusive of the short concealed pedicel, nearly 1 cm. long; calyx-tube 2 mm. long and broad, the limb 5 mm. broad, its lobes triangular-ovate, acuminate, 2 mm. broad, thick, pale and smooth like the leaves; corolla scarlet, thick, sparsely and very minutely pubescent outside, urceolate, 5 mm. long by 4 mm. broad.

Collected by Mr. Miguel Bang in Southern Bolivia (No. 876).

Description of Plates.

Plate CLXVII.

Brittonella pilosa, Rusby. (1) Typical plant; (2) flower; (3) petal, front view; (4) same, side view; (5) essential organs *in situ;* (6) perfect stamen, showing face; (7) same, side view; (8) imperfect stamen; (9) gynoecium; (10) immature fruit, side view; (11) pyramidal torns with 2 sepals in background; (12) radial vertical section of fruit.

Plate CLXVIII.

Lecanosperma lycioides, Rusby. (1) Typical fruiting branch; (2) flower; (3) calyx and pistil; (4) corolla laid open to expose stamens; (5) capsule with portion removed, lateral view of placenta and seeds; (6) same, front view of placenta with seeds; (7) concave face of seed; (8) convex face of seed.

Plate CLXIX.

Addisonia virgata, Rusby. (1) Typical flowering branch; (2) head in flower; (3) outermost involucral scale; (4) innermost involucral scale; (5) complete flower; 6) 3 of the stamens; (7) style-branches.

Plate CLXX.

Vacciniopsis ovata, Rusby. (1) Typical flowering branch; (2) flower with bracted pedicel; (3) nude calyx with pistil; (4) corolla laid open to expose stamens; (5) a stamen, face view; (6) the same, side view; (8) transverse section of ovary.

The Extent of the Annulus, and the Function of the different Parts of the Sporangium of Ferns in the Dispersion of Spores.*

By Geo. F. Atkinson.

A study of the sporangia of the different families of ferns made to determine the character of the so-called "complete annulus" makes it necesary to place some restrictions upon the use of that term as applied to the part of the annulus concerned primarily in the dispersion of the spores.

In the Polypodiaceæ the annulus is said to be "incomplete." It extends from the distal end of the stalk over the dorsum and vertex of the sporangium to the anterior upper angle. The lip cells in the front possess thickened and lignified walls, and between them the line of cleavage occurs at the moment of dehiscence. Between the upper lip cell and the anterior end of the annulus are two or three cells with walls exactly like those of the lateral walls of the sporangium. Similar cells also exist between the lower lip cell and the distal end of the stalk at the lower angle of the sporangium. These cells serve as connectives between the lip cells and the anterior end of the annulus on the one hand and the stalk on the other. At the moment of dehiscence they serve as a pull upon the lip cells as the annulus is everting. The lip cells being situated at the middle of the front divide the sporangium in halves and the line of cleavage started continues straight across the lateral walls of the sporangium. The connectives serve also another very important function. They are passive like the lateral walls and thus the halves of the sporangium remain intact while the annulus is being everted and preparing to spring. By this means the spores are held in place until the annulus springs when they are hurled violently away.

In the Cyatheaceæ, Gleicheniaceæ, and Hymenophyllaceæ the annulus is said to be "complete," *i. e.*, it extends entirely around the sporangium.

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* The substance of this paper was presented before the botanical section of the A. A. A. S. at the Madison Meeting.

In *Cyathea brunonis* and *Cibotium chamissoi* of the Cyatheaceæ which I have examined, divisions strictly homologous with those pointed put in the Polypodiaceæ are found. The true annulus, *i. e.*, that portion which functions as the spring, extends from the lower anterior angle of the sporangium, backward by the side of the stalk, up the dorsum and over the vertex to the anterior upper angle. A series of four to six lip cells similar in appearance to, but smaller than those of the true annulus, occupies the middle of the front. Between two of these the line of cleavage occurs. An upper and lower connective, each consisting of two or three cells exactly like those of the lateral walls of the sporangium, interrupts the so-called "complete annulus." Sporangia of both these species, which had lain in the herbarium over thirty years, when moistened with water and then dried, or treated with glycerine to extract the water from the cells of the annulus, opened promptly by the everting of the part of the annulus here designated as the true annulus. The spring also occurred with as much snap seemingly as might have taken place at the time of the dehiscence of the sporangium. The entire proceeding could easily be watched under the high power of the microscope, and it was easy to see which part functioned as the spring and which part was passive.

In *Hymenophyllum demissum* and *H. ciliatum* the true annulus occupies a greater portion of the circumference of the sporangium than in the Cyatheaceæ, but it is not complete. The short stalk is attached nearly perpendicular to the sporangium by the side of one end of the annulus. Narrow elongated lip cells are present joined to the annulus by two small connectives, and in dehiscence the sporangium is divided into halves.

In the Gleicheniaceæ as shown by *Gleichenia emarginata* the same divisions are present, but the connectives are quite large and prominent, as shown when a longitudinal section of the annulus is made.

In *Schizæa pusilla* and *Aneimia Phyllitidis* of the Schizæaceæ elongated lip cells and small connectives are present, and the true annulus when seen in side view and in section stands out quite prominently from the other parts of the ring of cells at the summit of the ovate sporangium.

In *Osmunda regalis*, *cinnamomea*, and *Claytoniana*, and *Todea rivularis* the same parts are present, the true annulus being situated upon the dorsum of the sporangium.

In all these families the sporangium is divided into halves at the time of dehiscence. The true annulus, the connectives and the lip cells perform identical functions in all. Were the annulus in any of them "complete," the highly developed mechanism which now serves the fern so perfectly in the dispersion of the spores would be defeated. During the eversion of a "complete" annulus the lateral walls of the sporangium would be torn to pieces and the spores would fall to the ground before the spring took place, and the present comparatively wide dispersion could not take place.

BOTANICAL DEPARTMENT, CORNELL UNIVERSITY.

Notes Upon a New Exobasidium.*

The genus *Exobasidium* is interesting in standing almost alone as containing parasites in the large group Thelephoreæ of the Hymenomycetous Fungi. Authors have differed as to the place the genus should hold in the classification, but Saccardo ignoring the views of Schroter and others, disposes of it as above stated. He describes eleven species, eight of which according to Farlow's Index are American. Of these only one is upon a host outside of the Heath family, namely, *Exobasidium Symploci*, E. & M. on *Symplocos tinctoria*, L. Her. The American species on Ericaceæ may be tabulated with the hosts as follows:

1. *Exobasidium Vaccinii* (Fl.) Woron.

On *Arbutus Menziesii*, *Arctostaphylus Uva-ursi*, *Cassiope tetragona*, *Gaylussacia resinosa*, *Rhododendron viscosum*, *Vaccinium macrocarpum*, *Vaccinium uliginosum*, *Vaccinium Vitis-Idaea*.

2. *Exobasidium Andromedæ*, Pk.

On *Andromeda ligustrina*.

3. *Exobasidium Azaleæ*, Pk.

On *Rhododendron nudiflorum*.

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*Read before the Botanical Club, A. A. A. S., Madison, Wis., August, 1893.

4. *Exobasidium discoideum*, Ell.
   On *Rhododendron viscosum.*
5. *Exobasidium Cassandræ*, Pk.
   On *Cassandra calyculata.*
6. *Exobasidium Arctostaphyli*, Hark.
   On *Arctostaphylos pungens.*
7. *Exobasidium decolorans*, Hark.
   On *Rhododendron occidentale*, and *Rhododendron viscosum.*

The seven species have twelve hosts, and *E. Vaccinii* has two-thirds of all. Three species are confined as far as yet known to a single host each, and *Rhododendron viscosum* bears three species.

From an economic standpoint the *E. Vaccinii* is the only species destructive to any crop, namely, to the cranberry. During this summer samples were sent me from Massachusetts asking for a remedy, the young stems being much distorted by the fungus.

The members of the genus as a rule are conspicuous, the general characteristic being a much swollen leaf or branch. The common azalea or Pinxter flower (*Rhododendron nudiflorum*) is known in many places as the "Swamp apple," because so generally producing upon the tips of the branches swollen masses, large as, and superficially somewhat resembles, green apples, the work of *E. Azaleæ*, Pk. In the same genus on *Rhododendron viscosum* is *E. discoideum*, Ell., which develops upon the under surface of the leaves large, turbinate or discoid galls two or more centemeters in diameter. The *E. Vaccinii* upon some hosts causes the stem to enlarge to many times its normal size. Galls of *E. Andromedæ*, Pk. are cupuliform and lobed, the hollow cavity containing cottony fibers and are, as the author states,* "lateral or rarely terminal on living branches, transforming the leaf buds."

On the 30th of May last the writer's attention was attracted to a group of *Andromeda Mariana* plants in a roadway near Farmingdale, N. J. The tips of the stems, instead of bending somewhat to one side and hanging full of the large white corolla bells characteristic of the species, were bolt upright, shorter than usual and bearing capitate masses of a pale green color. Upon inspection these were seen to be abnormally developed stems with their misshapen flowers in dense clusters. Some of the stems bore ordinary flowers a few inches below the malformed tips.

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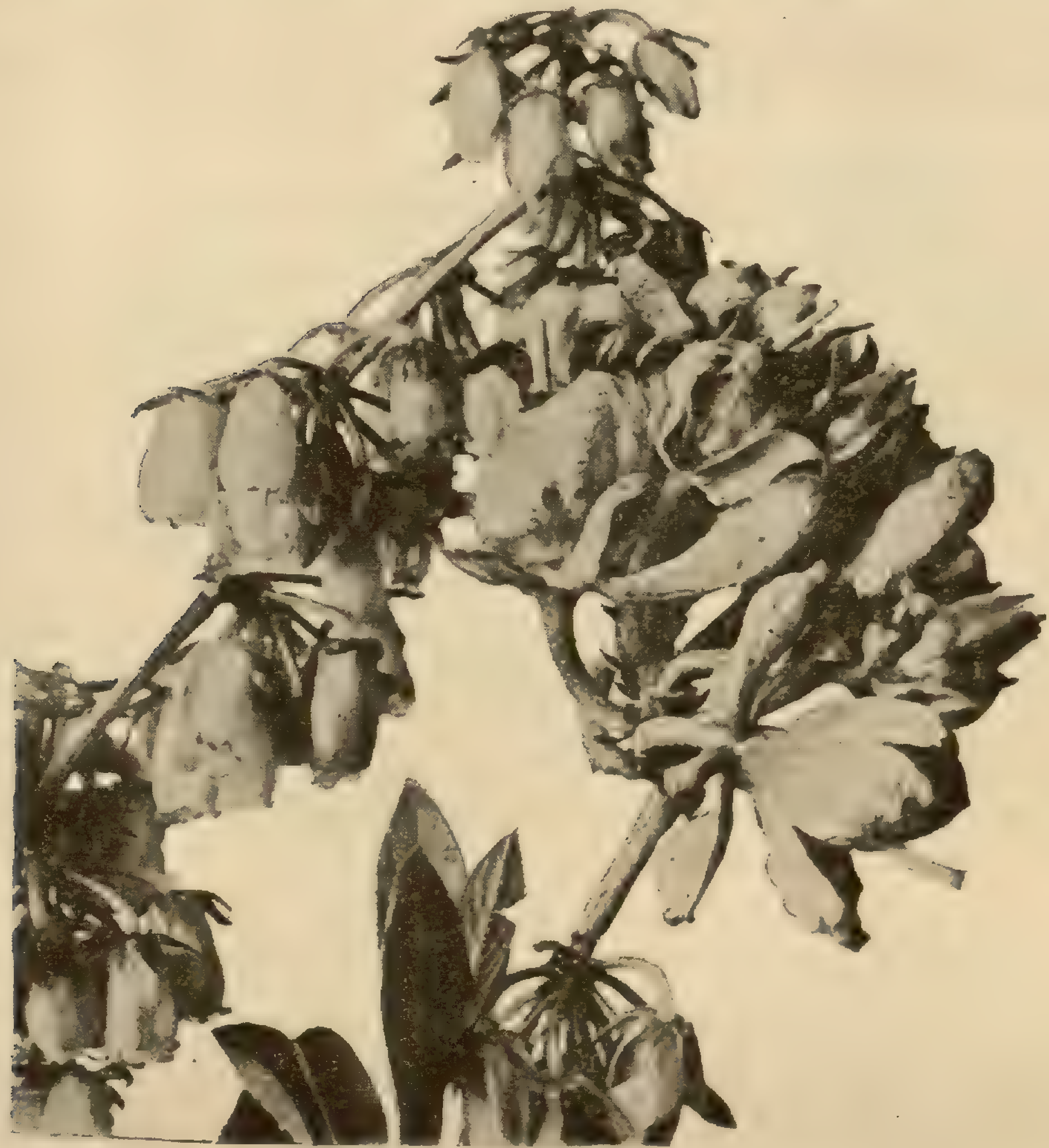
* Twenty-sixth Report of New York State Museum.

An examination assured me that the strange forms were due to an *Exobasidium,* and not being able to make it fit into any of the species described, was constrained to send specimens to Professor Peck, who is the author of three of the American species of *Exobasidiums*, including the one upon *Andromeda* above mentioned. He reported it as unknown to him. It is therefore with much pleasure that this second *Exobasidium* upon the *Andromeda* genus, the first bearing the generic name *Andromeda* by Professor Peck, is to be called *Exobasidium Peckii,* in honor of a life-long faithful laborer in American Mycology.



EXOBASIDIUM PECKII, HALS., CAUSING POLYPETALOUS FLOWERS IN ANDROMEDA MARIANA.

This species is remarkable in being confined almost entirely to the infloresences where it causes most extravagant enlargement and distortion of parts. Some of the single flowers are more than an inch in length and in spread of petals, the bell-shaped corolla being replaced by one that is wheel-shaped and polypetalous. A full study of all the abnormal floral organs might show points of structure of ordinary blossoms with added clearness and possibly throw light upon obscure parts. The ovary, for example, is raised a half inch or more above the receptacle and the peculiar placentæ greatly exaggerated.

The accompanying engraving is made from a photograph of a group of a healthy and an affected branch, and shows the abnormally exaggerated almost polypetalous flowers in striking contrast with the corolla bells of the ordinary form.

BYRON D. HALSTED.

RUTGERS COLLEGE, Aug. 2, 1893.

A new Station for Epipactis viridiflora (Hoffm.) Reichenb.

During the last summer one of my former students, Mr. H. B. Cushing, B. A., found an orchid on Mt. Royal, which, upon careful examination, proves to be what he at first took it for, *Epipactis viridiflora*. He first observed it on August 5th, growing on a rather dry, wooded hillside on the western slope of Mt. Royal, not far from the Côte des Neiges road, and in the vicinity of an old garden; at that time it was just coming into bloom. On August 25th, in the same locality, and within a small area, he found thirty or forty more specimens. Most of these had already gone out of flower, and some of them had ripened their seeds.

This discovery is of special interest, since, with the exception of the recently found station at Toronto,* there is no other known locality for this plant in Canada.

In 1820 and the following years, Dr. A. F. Holmes made a very thorough examination of the entire Island of Montreal, yet this species does not appear in his collection, nor is it to be found in any of the more recent works, such as those of Macoun and Provancher; and we are led to ask if this can be a recent introduction to our flora, or is it an old resident that has been wholly overlooked? The fact that it has not been found elsewhere in a district well known to local botanists, and that it occupies a very small tract, would seem to be opposed to the latter alternative.

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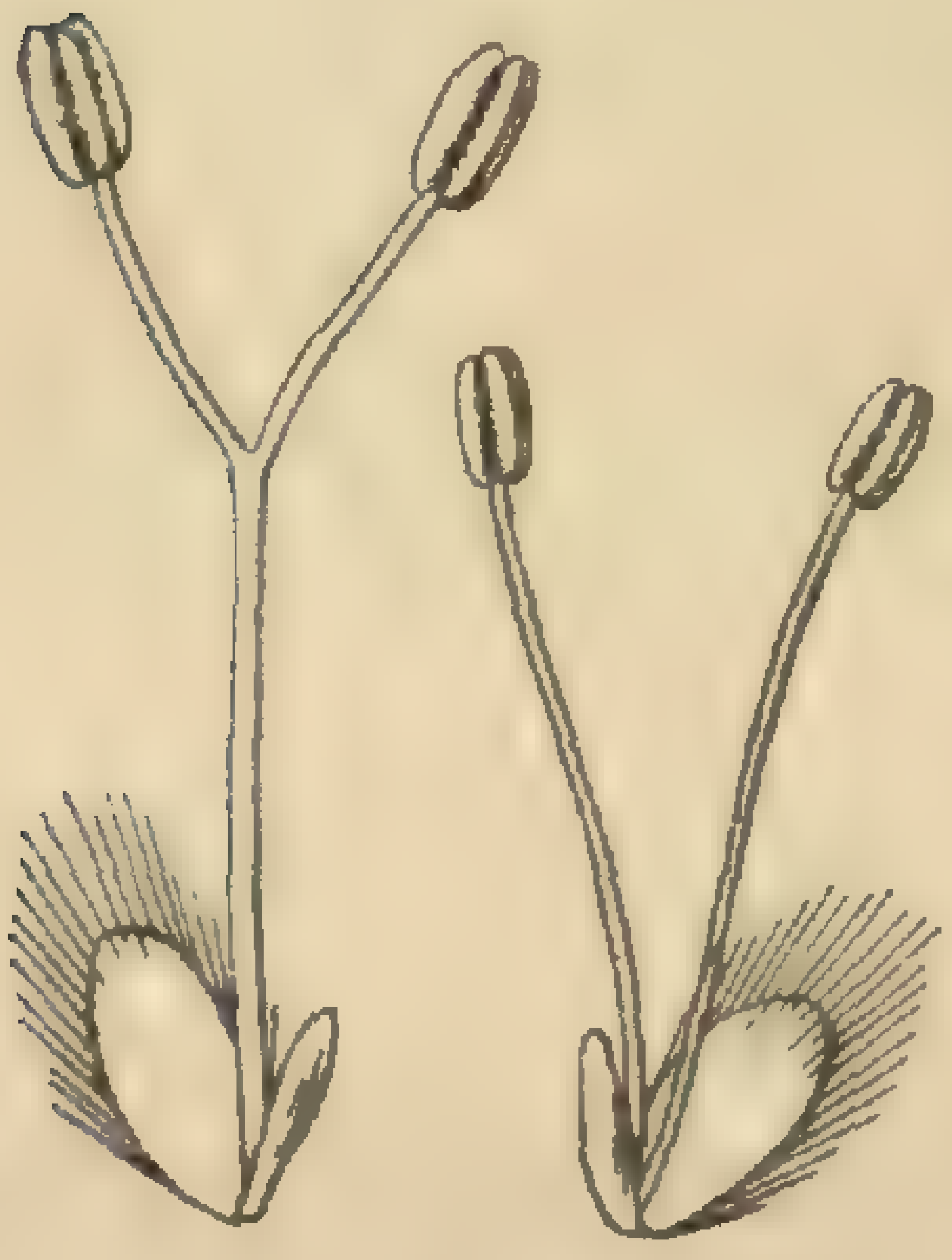
* Bull. Torr. Bot. Club xx. 36.

D. P. PENHALLOW.

MONTREAL, October, 1893.

Botanical Notes.

Cohesion of the Filaments in Salix myrtilloides.—Dr. Masters, in his Vegetable Teratology, records two examples of the cohesion of stamens in the genus *Salix*. He remarks, without mentioning the way in which the stamens are united, that this monstrosity exists normally in *S. monandra*. His other case is *S. calyculata*, in which Professor Anderson found the stamens joined so as to form a tube.



While examining some specimens of *S. myrtilloides*, collected near Royal Oak, Oakland county, Mich., by Dr. Wright, the filaments of all the stamens of the male flowers on one branch were found to be united for about two-thirds of their length, whence they separated and were developed in the usual manner. The accompanying figure shows two male flowers, the smaller one taken from a normal catkin of *S. myrtilloides;* the larger is from the specimen referred to above and shows the filaments united as described.

JOHN K. SMALL.

*Notes on Cicuta maculata.**—Members of the Botanical Club are aware of the widespread belief that cultivated parsnip when running wild is supposed to be poisonous. This, I think, has been set at rest by Professor Power's excellent investigation. Through Mr. Eugene Brown, a graduate of the Iowa Agricultural College,

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* Read by title before the Botanical Club, A. A. A. S. Madison meeting, August 1893.

I was permitted last spring to examine some roots in a case in which three children had consumed "Wild Parsnip." There were three boys respectively 5, 7 and 9 years of age. They were taken sick about one hour after eating the "Parsnip." The specimens sent me were excellently developed, and proved to be *Cicuta maculata.* Much of wild parsnip referred to commonly in Iowa is this species, and not the *Pastinaca sativa.* I might also report that I have eaten the wild *Pastinaca sativa* without injurious effects.

L. H. PAMMEL.

North American Fungi, Century XXX.—J. B. Ellis and B. M. Everhart. This, the 30th volume of the N. A. F., comes to hand in the neat form that has characterized all the preceding "Centuries." The volume contains a great variety of species ranging from *Æcidium* to *Venturia*, as shown by the alphabetical index. By groups, the "Century" opens with *Marasmus ramealis*, collected in West Virginia, by L. W. Nuttall (a strong botanical name) and closes with "3,000 *Hadotrichum Blasdalei*, Sacc. (in literis) on *Vicia gigantea*, Mill Valley, Cal., May, 1893, W. C. Blasdale." Several new species now first see the light as *Physalospora agrifolia*, E. and E., on leaves of *Quercus agrifolia*, Cal., W. C. Blasdale; *Leptosphæria occidentalis*, E. and E., on *Panicum Crus-galli*, Kansas, E. Bartholomew. In passing it may be said that the two above named persons have furnished a large number of interesting specimens. *Puccinia Blasdalei*, Diet. and Hol. (No. 2989) is another new species in which the California mycologist is honored. It was found by Mr. Blasdale on (?) *Allium serratum* in California in May of the present year. In like manner the Kansas collector gets full credit in No. "2990 *Puccinia Bartholomi*, Diet. Hedwigia, 1892, p. 290." On *Bouteloua oligostachya*, Rockport, Kas., January, 1893, E. Bartholomew." The editors of the N. A. F. present a new rust of their own in *Puccinia heterantha*, E. and E., on *Œnothera ovata*, collected by Blasdale in California, with specimens of laboratory cultures of its *Æcidium*, made by the discoverer. Also No. 2985 *Uromyces Chlorogali*, n. sp. (no authority given) on a *Chlorogalum*, a Blasdale-California find. There is a new smut, namely: No. 2983 *Urocystis Waldsteiniæ*, Pk. on *Waldsteinia fragarioides*, by C. L. Shear, an active worker in mycology at Alcove, N. Y. There is a good supply of the *Cer-*

cosporas, *Septorias* and *Phyllostictas* and *Peronospora Corydalis*, De By., is distributed. Near the last, but not least, are the teleutospore and æcidium forms of *Gymnosporangium globosum*, Farl.

B. D. H.

Duplicate Binomials.—My attention has recently been drawn to the use of specific names identical with the generic by H. Karsten, in his "Deutsche Flora," a pharmaceutical work of great value published in Berlin (?) from 1880 to 1883. As this antedates their acceptance in America, I here abstract those which apply to indigenous or introduced American plants. Our copy does not indicate the exact dates of the pages. Presumably the book was published in parts, and reference to an unbound copy will most likely be necessary for closer approximation than that given above.

Aruncus Aruncus (L.) Karst. Deutsche Flora, p. 779.
Batatas Batatas (L.) Karst. Deutsche Flora, p. 973.
Cakile Cakile (L.) Karst. Deutsche Flora, p. 663.
Catalpa Catalpa (L.) Karst. Deutsche Flora, p. 927.
Corallorhiza Corallorhiza (L.) Karst. Deutsche Flora, p. 448.
Coronopus Coronopus (L.) Karst. Deutsche Flora, p. 673.
Eragrostis Eragrostis (L.) Karst. Deutsche Flora, p. 389.
Fagopyrum Fagopyrum (L.) Karst. Deutsche Flora, p. 522.
Hepatica Hepatica (L.) Karst. Deutsche Flora, p. 559.
Lappula Lappula (L.) Karst. Deutsche Flora, p. 979.
Linaria Linaria (L.) Karst. Deutsche Flora, p. 947.
Negundo Negundo (L.) Karst. Deutsche Flora, p. 596.
Opuntia Opuntia (L.) Karst. Deutsche Flora, p. 888.
Petasites Petasites (L.) Karst. Deutsche Flora, p. 1062.
Petroselinum Petroselinum (L.) Karst. Deutsche Flora, p. 831.
Phragmites Phragmites (L.) Karst. Deutsche Flora, p. 379.
Sassafras Sassafras (L.) Karst. Deutsche Flora, p. 505.
Scolopendrium Scolopendrium (L.) Karst. Deutsche Flora, p. 278.
Sorghum Sorghum (L.) Karst. Deutsche Flora, p. 367.
Taraxacum Taraxacum (L.) Karst. Deutsche Flora, p. 1138.
Vincetoxicum Vincetoxicum (L.) Karst. Deutsche Flora, p. 1030.

N. L. B.

Reviews of Foreign Literature.

Revisio Generum Plantarum secundum leges nomenclaturæ internationales cum enumeratio plantarum exoticarum. Otto Kuntze (Part iii., Section 1, Leipzig, London, Milan, New York and Paris, 1893).

Since the publication of the first two parts of his now famous "Revisio," Dr. Kuntze has traveled extensively in South America and made large collections, the enumeration of which will make the greater portion of the third part of his work. On his return from his journeyings in the spring of the present year he found the questions of botanical nomenclature opened by his first volumes still considerably unsettled, at least in Europe, and determined to add to his previous important contributions to this subject.

The greater number of the pages at present noticed are taken up with the collation of everything that has been written on nomenclature during the last year and a half, with criticisms and suggestions thereon by the author, in which he naturally approves the remarks of those who have agreed with him, and pays his respects to those by whom he has been attacked. One hundred and twenty-four authors are cited and their writings abstracted nearly in full; of these, nineteen are Americans.

Chapters follow on "Orthographical License," in which a very complete list of similar but not identical generic names is presented, and a long series of principles proposed to determine which should be allowed to stand and which should be rejected, illustrating Dr. Kuntze's great linguistic attainments; on modifications of the Paris Code; on "1753, die Nomenclatur der Unbewussten," where he argues against the acceptance of the date of publication of the first edition of Linnæus' "Species Plantarum" as the point of departure in nomenclature of genera and species, thus disagreeing with the decision of the Genoa Congress, with that of the North American botanists and of the editors of the "Index Kewensis;" on "1737, der neue Compromise," where he indicates his present willingness to yield the 1735 date, in favor of 1737, and in this as in the preceding chapter gives a list of generic names which would be changed from those taken up in his previous volumes. The paper closes with a proposed list of international symbols for briefly designating various features of plants and with a summary of the principles of nomenclature which he thinks should now be adopted, consisting of seventy-five articles printed in German, English and French.

That Dr. Kuntze's contributions to the science of plant nomenclature have been the most valuable, the most voluminous and the most important ever made goes without saying. Their results however prove conclusively to our mind that uniform international agreement on all poinis is unattainable by the recommendations of congresses or persons to which the whole botanical world is expected to fully assent. We believe that uniform usage can be secured, however, by the adoption of a series of simple principles, supplementary to and explanatory of the Paris Code of 1867, by a national group of botanists' who will carry them out to the letter to the best of their knowledge and allow no exceptions whatever to interfere. This is what the North American botanists have well begun by the legislation effected at the Rochester and Madison meetings of the American Association for the Advancement of Science, and the preparation and printing of the catalogue of fern and flowering plants of Northeastern America there authorized, based on these principles, which is now in press.

We are more fortunate than our European brethren, inasmuch as we have no very great amount of inertia to overcome, and we have the instructive example of the previous work in just the same line by our ornithological colleagues, whose principles are receiving wider and wider adhesion, and who have not deviated one iota from their rules adopted some seven years ago. Bickerings over nomenclature are practically a thing of the past among our students of the feathered race. We believe that this millenium has arrived for our botanists. That errors will now and then be made in the readjustment of names is a necessary accompaniment of the conditions, but they can readily be corrected.

And this is the movement which the learned editor of the "Journal of Botany" facetiously and somewhat wrathfully alludes to as "the neo-American epidemic." Well, epidemics do a great deal of good, we believe, in the elimination of the weak and facilitating the survival of the fittest, and as to his compound adjective we cannot object, for everything American is new, and long may it so remain. But what will he think some day if some feeble-minded person may happen to designate the methods which he advocates as "palæo-Anglic?" N. L. B.

Proceedings of the Club.

TUESDAY EVENING, OCTOBER 10, 1893.

The President in the chair and twenty-five persons present.

A communication from Mr. Hartley C. Wolle, of Bethlehem, Pa., addressed to the President, was read, presenting to the Club a copy of Turner's Fresh Water Algae of East India, said copy having been forwarded by the author to the father of the writer, the Rev. Francis Wolle, who however did not live to receive it.

A communication to the Secretary from Sr. Luis Sodiro, of Quito, Ecuador, was read, accepting the honor of a corresponding membership in the Club and presenting a copy of his work on the Vascular Cryptogams of Ecuador. Dr. Britton spoke of the value of this work.

The scientific programme of the evening was then taken up, and summer experiences were related.

Dr. C. C. Curtiss reported his experiences during the summer at Wood's Holl, at Gay Head and at Casco Bay, where he collected many algae.

Mr. John K. Small stated that he had collected in Georgia, where he had been especially interested in the mosses, but had made large general collections. He was able to report on extension of the range of many species, the rediscovery of a number of rarities and the finding of a number of new species.

Mr. A. A. Heller had interested himself especially in the Southern Virginia boundary, the limit of the Manual region. His most interesting work had been the addition of quite a number of plants to the Manual list, notably that of *Cyrilla*. He thought that in order for collectors to be successful in this region it was very necessary that they consult the proper seasons for visiting respectively the coast region, the foot hills and the mountains.

His collections amounted to 13,000 or 14,000 specimens, representing some 500 species.

Mr. T. H. Kearney, Jr., had been collecting in Tennessee and Kentucky. He had devoted some three months to this work and obtained more than 5000 specimens. He noted some of his more important observations.

Mr. Geo. V. Nash reported collecting in the Catskills and exhibited specimens of several interesting species.

Mr. Henry Kraemer reported upon some laboratory work, referring especially to Belladonna root. He had found in the cortical tissue structures bearing all the characteristics of bast and had afterwards encountered notes by Prof. Schrenk to the same effect, and had verified the same by an examination of Prof. Schrenk's specimens. The supposed bast could be detected only after clearing and staining.

Mr. Theo. G. White had been specially occupied in geological work. At Lake Champlain he had obtained from the Potsdam sandstone a fine large fossil alga. Later, while at the World's Fair, he had made some interesting collections of the prairie flora.

The President exhibited two specimens of *Solidago speciosa*, one collected by himself many years ago on the line of Sixth ave., between 135th and 140th streets, where also *S. rigida* used to grow, the other recently collected in Westchester county by Dr. Margaret B. Wilson.

Dr. Britton exhibited and remarked upon some numbers of the American Botanical Register, obtained from the library of Dr. Hosack. He had not as yet been able to find any reference to this publication.

WEDNESDAY EVENING, OCTOBER 25, 1893.

Vice President Allen in the chair and twenty persons present.

The following papers were read:

1. "On the North American Species of the genus *Physcomitrium*," by Mrs. Britton. The paper was illustrated by specimens and drawings. The genus was originally described with three species, which in Lesquereux and James' "Manual" had been increased to six. Mrs. Britton's studies had led her to recognize eleven North American species, six of which she described as new.

The paper will be published in the BULLETIN at a future time.

2. "New Genera from Bolivia," by Dr. Rusby. The paper was illustrated by specimens and drawings, and is printed in this number of the BULLETIN.

Dr. Britton referred again to the copy of the "American Botanical Register," which he had exhibited at the preceding meeting, stating that he had found a reference to the work in Silliman's Journal for 1831, in the form of a prospectus where 100 colored plates of North American plants were proposed to be issued each year at a subscription price of $12.00. Washington was the place of publication.

He also exhibited a copy of Jung and Berlese's "Monographie du Genre *Camellia*," and *Viola Selkirkii*, *Amelanchier oligocarpa* and *Rubus setosus* from the Pocono plateau of Pennsylvania.

TUESDAY EVENING, NOVEMBER 14, 1893.

The President in the chair and thirty persons present.

A letter was received from Mr. E. D. McCabe, executor of the estate of Miss Phœbe A. McCabe, stating that her herbarium had been shipped to the Club, as per previous correspondence. It contains a large number of Westchester county plants.

The following persons were elected active members:

S. B. Parsons, Flushing, Long Island, N. Y.
Dr. G. Langman, 121 West 57th St., New York City.

The President stated that the herbarium accumulated by the late Mr. P. V. LeRoy, formerly Curator of the Columbia College Herbarium, and long a member of the Club, was offered for sale by his daughter, Mrs. Williams, of Peekskill, N. Y.

The Treasurer reported that the Club had received a bequest of $500.00 under the will of the late Isaac Buchanan, and that payment of the money was expected at some time during the coming year.

The following papers were read:

1. "Solandi Printing and its Applications to Botany," by Prof. Byron D. Halsted. The paper was illustrated by examples of the results obtained by the process of printing, and will be published in the December number of the BULLETIN.

2. "On the Altitudinal Distribution of Appalachian Ferns," by Mr. John K. Small. The paper was illustrated by specimens and a map, and will be published in the December number of the BULLETIN.

Index to Recent Literature Relating to American Botany.

Arthrophycus—Remarks on the Genus. Jos. F. James. (Journ. Cin. Soc. Nat. Hist. xvi. 82–86).

This paper was presented before Sec. E. of the A. A. A. S. at the Madison meeting, and was noted in the BULLETIN for September, 1893.

Asplenieas—Observaciones sobre algunos Helechos de la Tribu de las. Jose N. Rovirosa. (Naturaleza, ii. 179, illustrated).

Botanical Report. Brittain and Coxe. (Bull. Nat. Hist. Soc. New Brunswick, viii. 119).

Contains a list of rare plants found on a trip down the Restigouche, in July, 1888.

Cereus Peruvianus—Die Blüthe von. K. Schumann (Monatsch. Kakteenkunde, iii. 123).

Compositæ—Achenial Hairs of. Mary A. Nichols (Bot. Gaz. xviii. 378–383; one plate).

Cretaceous Floras in Canada and the United States, and on some new Plants of this Period—On the Correlation of early. J. W. Dawson (Trans. Roy. Soc. Canada, x. Sec. iv. 79–93, figs. 1–16.

The author begins with a review of previous work on the Cretaceous plants of British America and their correlation with such as had been found in the United States and Greenland.

The plants which are described were collected in the Cascade Coal Basin of the Rocky Mountains, and are all referred to the Kootanie formation. *Angiopteridium Canmorense* and *Pinus anthraciticus* are described and figured as new. A. H.

Cryptogamæ Vasculares Quitenses adiectis speciebus in aliis provinciis ditionis Ecuadorensis hactenus detectis. Auctore Aloisio Sodiro S. J. (8vo, Quiti, Typis universitatis, 1893, pp. 656, with index and 7 plates.)

In a short introduction the author states that although the fern flora of Quito had been previously collected both by Jameson and Spruce yet so rich is it in numbers and so extensive the still unexplored parts of Equador that he has been able to contribute many new species. In 1883 he published a work entitled "Recensio Cryptogamarum Quitensium," and the present one is intended not so much as an enumeration of the new species as a text-book to encourage others to further search. Hence, besides the Latin descriptions, there is a Spanish one for each species. The plates are all drawn from specimens in his herbarium, and there are keys for all the genera. This is unquestionably a valuable contribution to the literature of the ferns and their allies as well as a work of considerable importance on the local flora. E. G. B.

Cycad—A New. T. H. McBride (Am. Geol. xii. 248–250, Pl. xi.)

An illustrated description of a new species *Bennettites Dacotensis,* allied to *B. Gibsonianus,* Carr., found near Minnekahta, S. Dakota, in rocks which are probably of Lower Cretaceous age.

Cypripedium montanum. J. D. Hooker (Curt. Bot. Mag. xlix. tab. 7319.)

Does our Indegenous Flora give evidence of a recent change of climate? J. Vroom (Bull. Nat. Hist. Soc. New Brunswick, vii. 72–74.)

Echinocereus Salm Dyckianus. K. Schumann (Monatsch. Kakteenkunde, iii. 127, illustrated.)

Embryo-sac in Acer rubrum—Development of the. David M. Mottier (Bot. Gaz. xviii. 375–378, one plate.)

Ferns—Synoptical List. G. S. Jenman (Bull. Bot. Depart. Jamaica, Nos. 46–47, 1893.)

Species of the genus *Asplenium* are described.

Flora Brasiliensis—Fasciculus cxiii. Sapindaceæ 1. L. Radlkofer (Folio, pp. 225–356, tab. 58–80.)

This part is entirely eccupied with the the treatment of the genus *Serjania,* of which 81 Brazilian species are recognized, most of them first made known by the author in his previous extensive contributions to the literature of this group.

Flora Brasiliensis—Fasciculus cxiv. Orchidaceæ 1. A. Cogniaux (Folio, pp. 1–160, tab. 1–34.)

The genera, species and tribes of Cyripedilinæ, Ophrydinæ and Neottiinæ are here described.

Fossil Fungi. Jos. F. James (Journ. Cin. Soc. Nat. Hist. xvi. 94–98. Translated from the French of R. Ferry, in Rev. Mycologique, April (1893), 54–56.)

The author has performed a good deed in presenting this translation for the benefit of American readers. He also adds a few remarks and references at the close, which were not included in the original paper.

Fungus Diseases of the Sugar Beet. L. H. Pammel (Am. Mo. Mic. Journ. xiv. 189–200. Repr. from Bulletin No. 15, Iowa Agricultural Experiment Station.)

Halesia—The Use of the Generic Name. N. L. Britton (Gard. & For. vi. 433, Oct. 18, 1893; 463, 464, Nov. 8th, 1893. Edw. L. Greene, Erythea, i. 236, Nov. 3, 1893.)

The name *Halesia*, P. Br., is shown to belong to a West Indian tree, now referred to *Guettarda*, L., and *Mohria* is proposed to replace the later *Halesia*, Ellis, by Dr. Britton in his communication to "Garden and Forest," printed in the issue of that journal of October 18th. His attention having been called to the publication of a genus *Mohria* by Swartz in 1806 for a South African genus of ferns, and that in the attempt to correct one hononym he had inadvertently made another, Dr. Britton, in the issue of "Garden and Forest" for November 8th, proposes the name *Mohrodendron.* In both communications the species are named, thus effecting publication under Section 2 of the rules adopted by the Botanical Club of the American Association for the Advancement of Science at the Rochester meeting. Prof. Greene, in the issue of "Erythea" for November 3d, proposes the generic name *Carlomohria*, this name thus having five days' priority over *Mohrodendron.* But he neither publishes a description of the genus nor names species belonging to it, and thus, under the same section of the Rochester rules, has not effected publication. All three of the names have been given in honor of Dr. Charles Mohr, of Mobile, Alabama.

Hepaticarum species novæ III. F. Stephani (Hedwigia, xxxii. 204–214).

This is taken up with descriptions of new *Bazzanias*, among them one from Magellan, and one from Peru.

Inter-twining of Tendrils. D. T. MacDougal (Bot. Gaz. xviii. 396–397).

Notes on the tendrils of *Micrampelis echinata* and *Parthenocissus quinquefolia.*

Juniperus—Fructification of. John G. Jack (Bot. Gaz. xviii. 369–375; one plate).

Lake Superior Region—A Contribution to the Flora of the. L. S. Cheney (Trans. Wisc. Acad. ix. 233).

Three hundred and forty-five species are listed, including Musci and Hepaticæ.

Mamillaria radiosa, Engelm. (Monatssch. Kakteenkunde, iii. 132, illustrated).

Marine Algæ of the Maritime Provinces. G. U. Hay (Bull. Nat. Hist. Soc. New Brunswick, vi. 62–68).

Comprises a list of 84 species with notes.

Notes on a small Collection of Plants, collected in Southwest Colorado by Mr. J. Cardwell Lees. J. C. Melvill (Mem. and Proc. Manchester Lit. and Phil. Soc. vii. 4th Ser. 214–219).

Penicillium and some other Fungi. H. L. Osborn (Amer. Month. Micros. Journ. xiv. 241–249).

Philosophy of Flower Seasons—The. Henry L. Clarke (Am. Nat. xxvii. 769, reprint).

Pontederia cordata, L.—The Histology of the Stem of. E. M. Wilcox (Journ. Cincin. Soc. Nat. Hist. xvi. 101, illustrated).

Prenanthes alba (Meehan's Month. iii. 161, illustrated).

Problematic Organisms—Studies in.—No. ii. The Genus Fucoides. Jos. F. James (Journ. Cin. Soc. Nat. Hist. xvi. 62–81. Pl. III.–V.).

In this contribution the author has performed an act for which many will be grateful. He has first of all included a full translation of Brongniart's little known paper published in Mem. Soc. Hist. Nat. Paris i. (1823) 301–321, entitled "Observations on *Fucoides* and on some other Fossil Marine Plants." The evil which Brongniart inevitably invited is pointed out, viz: that the genus *Fucoides* as defined by him, was so broad that it was made the dumping ground for all sorts of fossils, inorganic markings and casts. About 100 different species and varieties have been included under it. Subsequent work by Brongniart and by Sternberg is referred to, in which the attempt was made to divide *Fucoides* into genera and sub-genera in accordance with supposed affinities with living genera. These and other described forms are criticised as to their algal affinities, and in many instances as to their organic or inorganic origin by the author, who finally ends with a list of the species which have been described under the genus *Fucoides*, with authority and date of publication, together with the names under which they are now recognized. The author has followed the rule of priority in nomenclature, so that many changes in name may be noted. Thus *Fucoides Alleghaniensis*, Harlan (1831), becomes *Arthrophycus Alleghaniensis* (Harlan) and not *A. Harlani*, Hall (1852). The only species which the author would retain under the old genus *Fucoides* is *F. strictus*, in accordance with laws of nomenclature, one of which "requires that the first species of a genus proposed be taken as the type of that genus." A. H.

Ruthenium Red in Plant Histology. A. B. Aubert (Am. Mo. Micr. Journ. xiv. 232).

Translation and condensation of a communication to the Academie des Sciences, Paris, December 26, 1892, by Mr. A. Joly.

Salix—A Study of the Venation of. N. M. Glatfelter (Ann. Rep. Miss. Bot. Gard. v.; reprint; illustrated).

Sketch of the Botany of Ireland. A. G. Moore (Journ. Bot. xxxi. 299–304).

Notes on a considerable number of Irish plants. Chapter I deals with the American species represented: *Spiranthes Romanzoffiana*, now known from several stations, *Sisyrinchium angustifolium* at several Galway and Kerry localities, but not certainly indigenous, *Juncus tenuis* and the recently observed *Polygonum sagittatum* (misspelled *sagittifolium*), pretty clearly introduced.

Vacation Collecting. W. Whitman Bailey (Bot. Gaz. xviii. 395).

Notes on plants found at Little Compton, R. I. *Senebiera Coronopus* is reported as occurring in great abundance.

Winchellia—The Genus. N. H. Winchell (Am. Geol. xii. 209–213, Pl. VIII., IX.).

This article is based upon a specimen representing a new Cretaceous genus, from the Yellowstone River, of which the description with accompanying figures was prepared by Leo Lesquereux, who proposed to name it after the author. During the delay and uncertainity, incident to publication by the United States Geological Survey, Rev. Mr. Hertzer chose the same name, for a new genus of Carboniferous trees, in honor of Alexander Winchell. The same name was also about to be applied by another palæontologist to a new genus of mollusks.

The details of whatever friendly controversy ensued are not given, but eventually the name was cancelled for the molluscan genus and the name *Winchellina* was adopted for the Carboniferous tree, thus leaving the way clear for the publication of Lesquereux's original name. The species is described and figured therefor as *Winchellia triphylla.* Its affinities are with the Berberidaceæ, and in order to emphasize this there is given a figure of a leaf of *Achlys triphylla*, D. C., for purposes of comparison.

But the matter of greatest interest connected with it is that we have in this new fossil, the leaf of a plant which belongs to an order now recognized in the fossil form for the first time in America. Further than this, a comparison of the pods of *Jeffersonia diphylla*, with certain fossil fruits from the tertiary lignites of Brandon, Vt. (originally described as *Carpolites Brandonianus*, Lesq.), show that these are evidently closely allied to each other, if not actually belonging to the same genus.

In order that the comparisons may be readily appreciated, the illustrations include in addition to the leaves of *Winchellia triphylla* and *Achlys triphylla* the fruit *Carpolithes Brandonianus*, and a pod of *Jeffersonia diphylla.* A. H.

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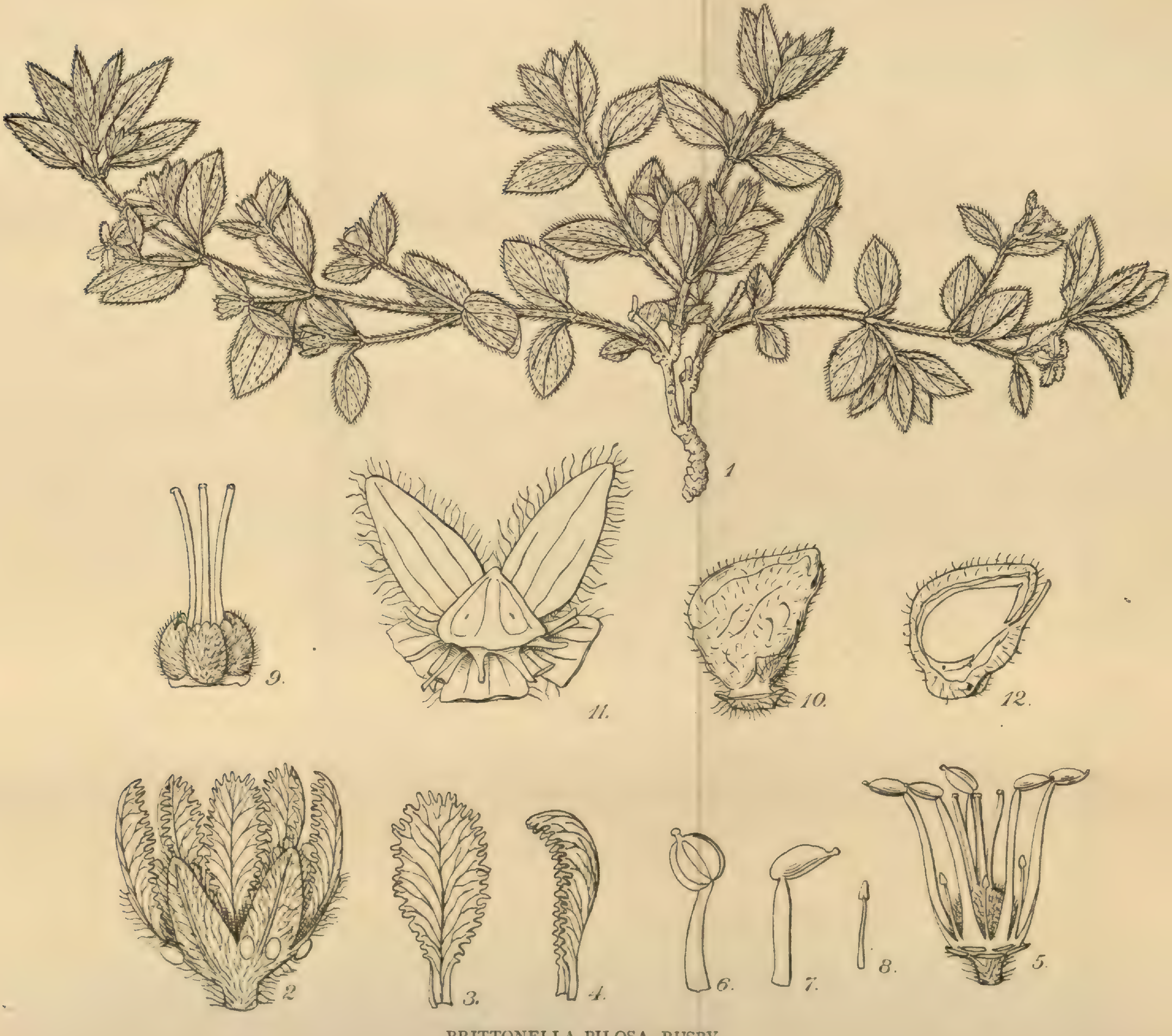
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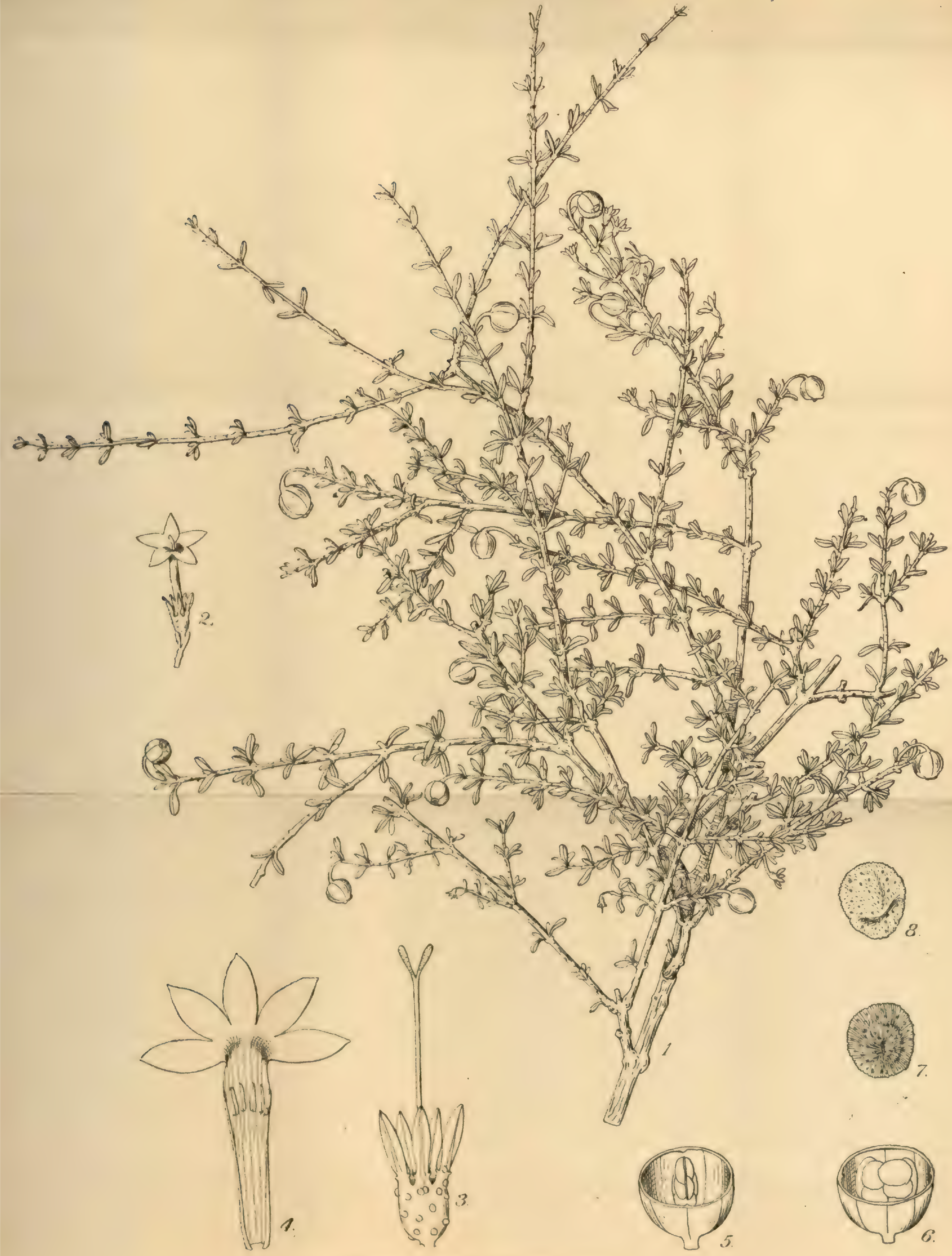

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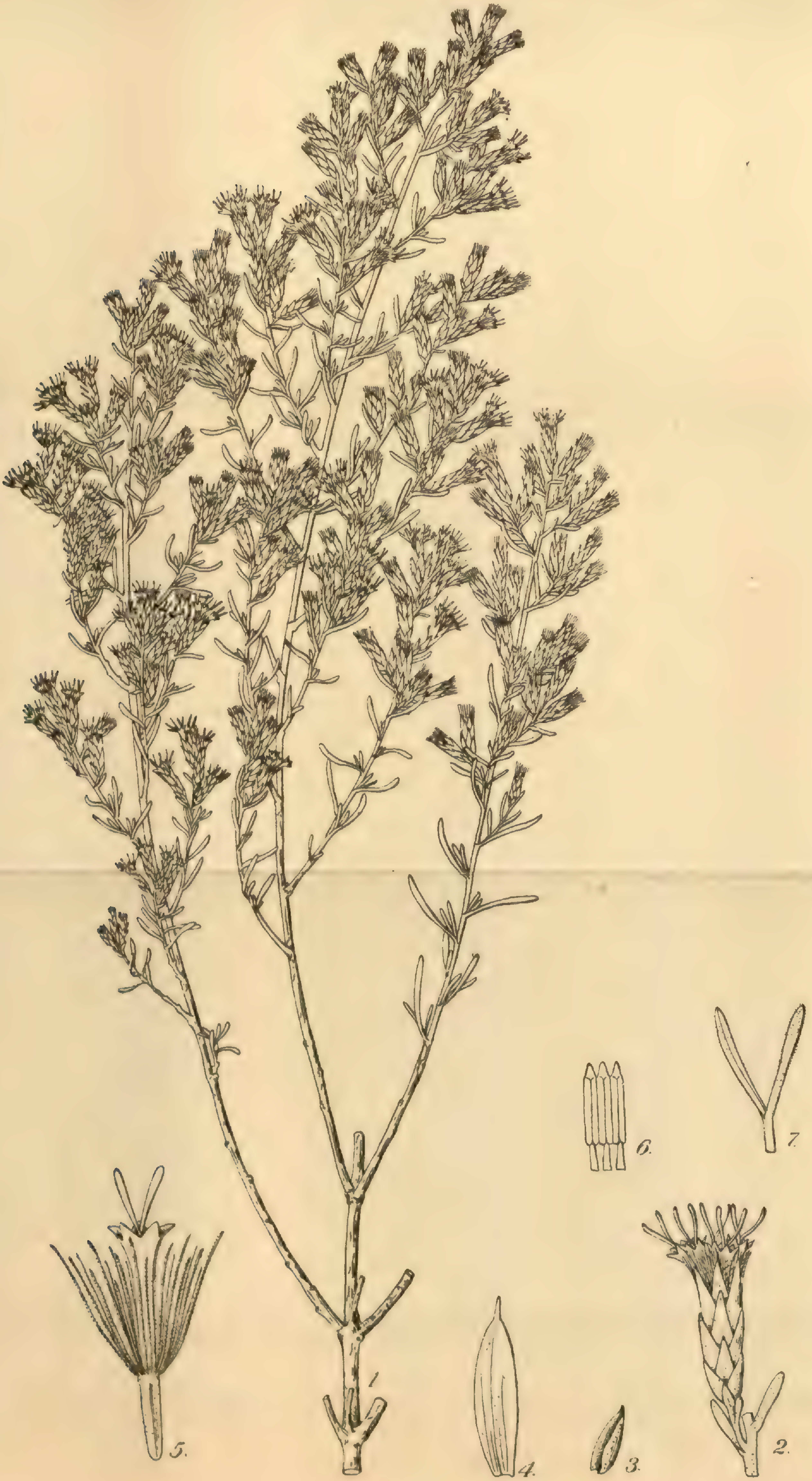

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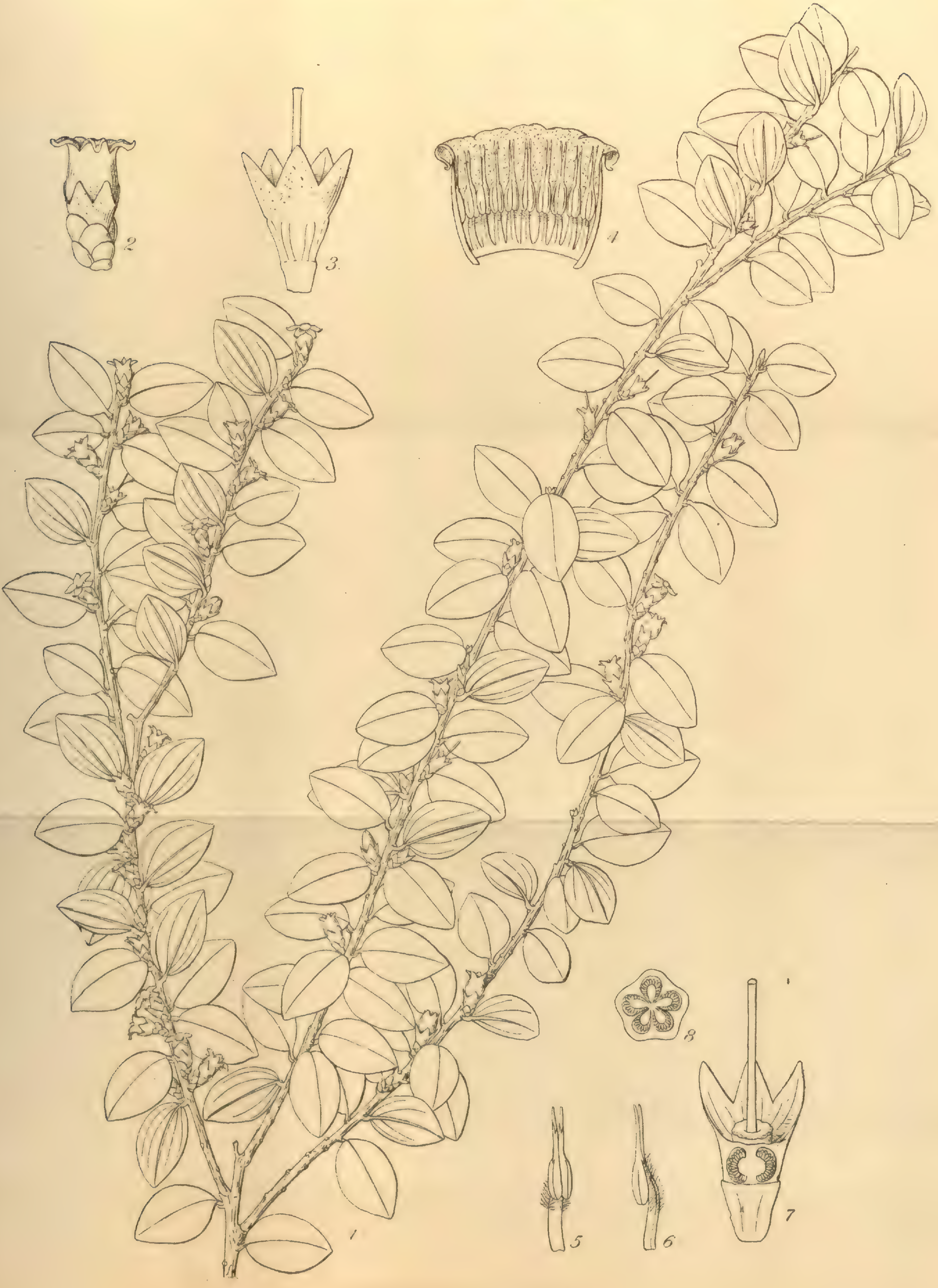

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EDITED BY

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AND OTHER MEMBERS OF THE CLUB.

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BULLETIN

OF THE

TORREY BOTANICAL CLUB.

Vol. XX. Lancaster, Pa., December 26, 1893. No. 12.

The Altitudinal Distribution of the Ferns of the Appalachian Mountain System.

By John K. Small.

The following paper is a small portion of the results obtained in collecting and tabulating the altitudes observed and recorded for the plants of the East American Flora. The work was finished last winter, but was then, and is still, withheld from publication in order that more observations may be secured. It is too incomplete as yet to furnish any exact conclusions, and this part is here presented for the purpose of calling attention to this still almost entirely unknown department of Eastern North American Botany.

Careful and systematic altitudinal observations of plant stations have for a long time been recorded in England, and in the last few years the work has been prosecuted to some extent by Dr. C. Hart Merriam and his assistants in the pursuit of his biological survey for a portion of Arizona, especially in the vicinity of San Francisco Mountain. But in the eastern part of our continent, where the floral features are perhaps better known than anywhere else in North America, there is practically nothing on record concerning it. It is hoped that this preliminary contribution will excite an interest in the subject among our botanists and lead them to observe and record, as nearly correct as possible, the altitudes of the plants with which they may meet, especially in the Appalachian Mountain system and the contiguous territory.

A tentative attempt has been made to correlate the distribution of the following ferns with the faunal distribution as worked out by Dr. J. Allen (*Geographical Distribution of North American Mammals*, *Bull. Amer. Mus. Nat. Hist. iv. 199-244* (*1892*)), and I have used the terms applied by him there to faunæ for floræ. In the main, the distribution of ferns appears to agree with that of mammals, but there seem to be some discrepancies which further observations may tend to reduce.

Dr. Allen has divided and subdivided the faunal areas of North America into *Realms*, *Regions*, *Subregions*, *Provinces*, *Subprovinces*, *Districts* and *Faunæ*. The latter only need concern us at present, and of his eleven faunæ four cover the territory under consideration. These are known as the CANADIAN, the ALLEGHANIAN, the CAROLINIAN, and the LOUISIANIAN, and their geographic limits in the following lines are taken from Dr. Allen's paper already mentioned; however, their western portions are not considered here.

1. The CANADIAN FLORA includes the northern half of New England, Northern Ontario, New Brunswick, Quebec, and the southwestern angle of Newfoundland. In addition to this more or less connected area, it is represented by detached tracts of greater or less extent along the summits of the Appalachian Mountain System as far south as Georgia.

2. The ALLEGHANIAN FLORA is bounded on the north by the *Canadian*, and on the south by the *Carolinian*. It runs southward as an irregular belt on the upper slopes of the mountains, separating the *Canadian* from the *Carolinian*.

3. The CAROLINIAN FLORA meets the *Alleghanian* on the north in Pennsylvania, New York and New Jersey, and doubles the mountain system where the latter runs out in Northern Alabama and Georgia. It passes into the plains on the west and on the east descends into the pene-plains, reaching the Atlantic Ocean from Virginia to New York, and separated from the water from Virginia southward by the *Louisianian*.

4. The LOUISIANIAN FLORA includes all the Southern States south of the *Carolinian* except the extreme end of South Florida.

Now, what I hope to be able to work out in the future is: 1.—how far the *Canadian flora* descends down the slopes from the summits of our highest mountain peaks; 2.—at what altitude the

Canadian meets the *Alleghanian flora* along the upper slopes, and how far the latter extends down the mountain sides; 3.—the altitude to which the *Carolinian* rises to meet the *Alleghanian;* 4.—the line where the Louisianian and the Carolinian come together. This can be done only by the collection and tabulation of an immense number of altitudinal observations on all the plants of Eastern North America, and I take occasion through this channel to ask my fellow botanists to note and record careful observations when in the field, and report to me at their convenience.

Of course, the areas, belts or lines, as the case may be, will be affected by local conditions, and are influenced in the same way by the latitude as well as the altitude, the latter being a more or less perfect exhibition of the former in a perpendicular manner. On account of the influence of latitude the lines which bound the different areas will, if we start at the north and go south, gradually converge towards the mountains and rise towards the summits as the latitude decreases. If the direction be from south to north the lines will descend from the highlands and diverge at angles or curves from the mountains, expanding into broad areas towards the north. The problem is, as already stated, to locate these lines.

With the assistance of data at hand and the geographic distribution, the ferns as given below have been placed each in its respective flora or floras, and by the aid of altitudes the direction of the lines can be seen in a general way.

POLYPODIUM POLYPODIOIDES (L.) A. S. Hitchcock. (*Polypodium incanum*, Swartz.). Ranges from sea-level, from Virginia Beach, Va. (Britton) to Florida and the Gulf coast to 4,000 feet on Blowing Rock Mt., N. C. (Small & Heller); occurs at 1,000 feet in Winston county, Ala. (Mohr); at 3,000 feet at Estatoah Falls, Ga. (Small); at 2,100 feet at Marion, Va. (Miss Vail). [*Southern Carolinian; Louisianian.*]

POLYPODIUM VULGARE L. Ranges from sea-level along the Atlantic coast, from Central New Jersey northward to 5,800 feet on Grandfather Mt., N. C. (Small & Heller); occurs at 1,000 feet in Winston county, Ala. (Mohr); at 3,000 feet in Rabun county, Ga. (Small); at 5,678 feet on White Top Mt., Va. (Small); at 2,700 feet in Garrett county, Md. (J. D. Smith); at

2,300 feet on the Pocono Mt., Pa. (Porter); at 2,100 feet near Onteora, N. Y. (Miss Vail); at 4,000 feet in Northern Vermont (Pringle). [*Carolinian; Alleghanian; Canadian.*]

CHEILANTHES ALABAMENSIS (Buckl.) Kunze. Occurs at 450 feet in Bibb county, Ala. (E. A. Smith); at 600 feet near Florence, Ala. (Mohr); at 1,000 feet in Lawrence county, Ala. (Mohr). [*Carolinian.*]

CHEILANTHES TOMENTOSA Link. Occurs at 600 feet near Florence, Ala. (Mohr); at 1,900 feet in Swain county, N. C. (Beardslee & Kofoid); at 1,000 feet at Toccoa Falls, Ga. (Small); at 1,500 feet on the highest ridge in Talladega county, Ala. (Mohr). [*Carolinian.*]

CHEILANTHES LANOSA (Michx.) Watt. (*Cheilanthes vestita*, Swartz.) Ranges from near sea level along the Atlantic coast from New York southward to 1,900 feet in Swain county, N. C. (Beardslee & Kofoid); occurs at 750 feet in Gwinnett county, Ga. (Small); 800 feet at in Cullman county, Ala. (Mohr); at 1,000 feet at Roanoke, Va. (Britton); at 1,500 feet at Harper's Ferry, Md. (J. D. Smith); at 250 feet in Lancaster county, Pa. (Porter). [*Alleghanian; Carolinian. ?*]

PELLÆA ATROPURPUREA (L.) Link. Ranges from 150 feet at Tuckahoë, N. Y. (Mrs. Britton) to 2,200 feet in Smyth county, Va. (Small); occurs at 1,000 feet in Ala. (Mohr); at 2,000 feet on Mt. Willoughby and Mt. Horr, Vt. (Faxon). [*Alleghanian.*]

PELLÆA GRACILIS (Michx.) Hooker. Ranges from 2,000 feet in Sullivan county, Pa. (C. E. Smith) to 2,500 feet on Mt. Willoughby, Vt. (Faxon), descends to 100 feet in Northern Vermont (Pringle). [*Alleghanian.*]

PTERIS AQUILINA L. Ranges from sea level along the Atlantic coast to 5,000 feet on Grandfather Mt., N. C. (Small and Heller); occurs at 3,000 feet in Rabun county, Ga. (Small); at 3,500 feet on the Iron Mts., Va. (Mrs. Britton); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,300 feet on the Pocono Plateau, Pa. (Porter); at 1,200 feet at Westmore, Vt. (Deane); at 1,200 feet at Jaffrey, N. H. (Deane). [*Canadian, Alleghanian, Carolinian, Louisianian.*]

ADINATUM CAPILLUS-VENERIS L. Ranges from sea level in Florida to 250 feet in Central Alabama (Mohr); occurs at 700 feet at South Pittsburg, Tenn. (Middleton); at 1,3000 feet at Cumberland Falls, Ky. (J. D. Smith). [*Louisianian; Carolinian.*]

ADIANTUM PEDATUM L. Ranges from sea level, along the Atlantic coast from New Jersey northward, to 5,000 feet on White Top Mt., Va. (Small); occurs at 1,000 feet in Northern Alabama (Mohr); at 1,200 feet near Toccoa Falls, Ga. (Small); at 4,000 feet on Blowing Rock Mt., N. C. (Small and Heller); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet near Onteora, N. Y. (Miss Vail); at 1,000 feet at Franconia, N. H. (Faxon); at 2,500 feet in Willoughby Mt., Vt. (Faxon). [*Carolinian; Alleghanian.*]

WOODWARDIA AREOLATA (L.) Moore. Ranges from sea level along the Atlantic coast to 3,000 feet in the Great Smoky Mts., N. C. (Beardslee & Kofoid); occurs at 800 feet near Cullman, Ala. (Mohr). [*Louisianian; Carolinian; Alleghanian.*]

WOODWARDIA VIRGINICA (L.) Smith. Ranges from sea level along the Atlantic and Gulf coasts to 1,300 feet in Huntingdon county, Pa. (Lowrie); occurs at 200 feet near Colchester, Vt. (Pringle); at 300 feet at Belchertown, Vt. (Jesup). [*Louisianian; Carolinian; Alleghanian.*]

ASPLENIUM ACROSTICHOIDES Swartz. Ranges from near sea level along the Atlantic coast, from New Jersey northward to 5,000 feet on White Top Mt., Va. (Mrs. Britton); occurs at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 1,000 feet at Amherst, Vt. (Brainerd); at 1,500 feet at Willoughby, Vt. (Rusby). [*Alleghanian.*]

ASPLENIUM ANGUSTIFOLIUM Michx. At 200 feet in Vermont (Pringle); ascends to 1,000 feet at Danville, Vt. (Faxon); occurs at 3,700 feet on Blue Mt., N. Y. (Miss Knight); at 1,200 feet in Blair county, Pa. (Porter); at 1,000 feet in Winston county, Ala. (Mohr). [*Alleghanian.*]

ASPLENIUM BRADLEYI D. C. Eaton. At 1,600 feet on Lookout Mt., Ala. (Mohr); descends to 1,000 feet at Stone Mt., Ga. (Small); to 260 feet in Lancaster county, Pa. (Small). [*Alleghanian.*]

ASPLENIUM EBENOIDES R. R. Scott. Ranges from sea level at Philadelphia, Pa. (Scott), to 1,400 feet at Mt. Crawford, Va. (Heller); occurs at 400 feet in Hale county, Ala. (Miss Tutwiler); at 300 feet near Easton, Pa. (Porter, Small); at 500 feet in Sussex county, N. J. (Rusby); at 700 feet near Canaan, Conn. (Adam). [*Alleghanian.*]

ASPLENIUM FONTANUM (L.) Bernh. Occurs at about 600 feet above Williamsport, Pa. (McMinn).

ASPLENIUM FILIX-FŒMINA (L.) Bernh. Ranges from sea level along the Atlantic coast to 6,000 feet on Grandfather Mt., N. C. (Small & Heller); occurs at 800 feet in Cullman county, Ala. (E. A. Smith); at 5,000 feet on White Top Mt., Va. (Mrs. Britton); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 2,000 in Northern Vermont (Brainerd, Rusby). [*Louisianian; Carolinian; Alleghanian; Canadian.*]

ASPLENIUM MONTANUM Willd. Ranges from Northern Pennsylvania to Georgia along the mountains, descends from 4,500 feet on Grandfather Mt., N. C. (Small & Heller) to 260 feet in Lancaster county, Pa. (Porter); at 1,600 feet on Lookout Mt., Ala. (Mohr); at 1,500 feet in Georgia (Small); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 1,500 feet on Mt. Tammany, N. J. (Knipe). [*Alleghanian.*]

ASPLENIUM PARVULUM Mart. & Gal. Ranges from near the Atlantic coast, from Florida to Virginia, to 2,400 feet in Smyth county, Va. (Small); occurs at 1,000 feet in Lawrence county, Ala. (Mohr); at 1,700 feet near Johnson City, Tenn. (Porter). [*Louisianian; Carolinian.*]

ASPLENIUM PINNATIFIDUM Nutt. Ranges from sea level at Philadelphia, Pa. (Nuttall) to 4,300 feet on Grandfather Mt., N. C. (Small & Heller); occurs at 600? feet in Blount county, Ala. (J. D. Smith); at 1,500 feet at Stuart, Va. (Heller); at 1,500 feet at Harper's Ferry, Md. (J. D. Smith); at 300 feet in Eastern Pennsylvania (Porter). [*Alleghanian.*]

ASPLENIUM PLATYNEURON (L.) Oakes. Ranges from sea level along the Atlantic coast to 4,200 feet on Blowing Rock Mt., N. C. (Small & Heller); occurs at 2,000 feet in Rabun county, Ga. (Small); at 2,700 feet in Garrett county, Md., (J. D. Smith); at 2,000 feet in Monroe county, Pa. (Porter); at 500 feet in Vermont (Brainerd, Pringle). [*Alleghanian; Carolinian.*]

ASPLENIUM RUTA-MURARIA, L. Ranges from Vermont to New Jersey at about 300 feet; occurs at 1,600 feet on Lookout Mt., Ala. (Mohr); at 1,500 feet at Warm Springs, N. C. (J. D. Smith); at 2,100 feet at Marion, Va. (Judge Brown); at 250 feet in Northampton county, Pa. (Porter); at 2,200 feet on Mt. Willoughby, Vt. (Faxon). [*Alleghanian.*]

ASPLENIUM TRICHOMANES, L. Ranges from near sea level from New Jersey northward to 2,500 feet on Mt. Mansfield and Mt. Horr, Vt. (Faxon); occurs at 2,000 feet on the Pocono Mt., Pa. (Porter); at 2,100 feet in Smyth county, Va. (Small); at 1,000 feet near Gadden, Ala. (Mohr). [*Alleghanian.*]

ASPLENIUM VIRIDE, Hudson. At 4,000 feet on Mt. Mansfield, Vt. (Pringle) descends to 2,000 feet in Smuggler's Notch, Vt. (Faxon). [*Canadian; Alleghanian?*]

SCOLOPENDRIUM SCOLOPENDRIUM (L.) Karst. (*Scolopendrium vulgare*, Smith.) Ranges from about 800 feet in Onondago county, N. Y. (Pursh and others) to 700 feet near South Pittsburg, Tenn. (Cheatham). [*Alleghanian; Carolinian.*]

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. Ranges from sea level in New Jersey and New York to 3,000 feet near Blowing Rock, N. C. (Small and Heller); occurs at 2,500 feet in Smith county, Va. (Small); at 100–500 feet in Northern Vermont (Faxon, Brainerd). [*Carolinian; Alleghanian.*]

PHEGOPTERIS DRYOPTERIS (L.) Fee. Ranges from 500? feet in Western New Jersey to 2,000 feet at Onteora, N. Y. (Miss Vail); occurs at 1,000 feet in Hampshire county, W. Va. (J. D. Smith); at 1,100 feet in Luzerne county, Pa. (Heller); at 1,300 feet at Westmore, Vt. (Deane); at 2,000 feet at Randolph, N. H. (Churchill). [*Alleghanian.*]

PHEGOPTERIS HEXAGONOPTERA (L.) Fee. Ranges from near sea-level along the Northern Atlantic coast to 4,000 feet on Roan Mt., N. C. (Britton); occurs at 600 feet at Florence, Ala.

(Mohr); at 2,400 feet near Marion, Va. (Mrs. Britton); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 500 feet in Northern Vermont (Brainerd). [*Louisianian; Carolinian; Alleghanian.*]

PHEGOPTERIS PHEGOPTERIS (L) Underw. (*Phegopteris polypodioides* Fee.) Ranges from 600 feet at Newton, N. J. (Miss Thompson) to 4,000 feet in Northern Vermont (Pringle); occurs at 2,000 feet in Monroe county, Pa. (Mrs. Britton); at 2,200 feet at Onteora, N. Y. (Miss Vail); at 2,500 on Willoughby Mt., Vt. (Rusby). [*Alleghanian; Canadian.*]

DRYOPTERIS BOOTTII (Tuckerm.) Underw. Ranges from sea level from New Jersey to Massachusetts, to 2,000 in Northern Vermont (Brainerd). [*Alleghanian.*]

DRYOPTERIS CRISTATA (L.) A. Gray. Ranges from near sea level, from New Jersey northward, to 2,700 feet in Garrett county, Md. (J. D. Smith); occurs at 2,000 feet on the Pocono Mt., Pa. (Porter); at 1,200 feet at Jaffrey, N. H. (Deane); at 1,300 feet at Westmore, Vt. (Deane). [*Carolinian; Alleghanian.*]

DRYOPTERIS CRISTATA, var. CLINTONIANA (D. C. Eaton) Underw. Ranges sea level from New Jersey northward to 1,300 feet at Westmore, Vt. (Deane). [*Carolinian; Alleghanian.*]

DRYOPTERIS FRAGRANS (L.) Schott. At 2,000–4,000 feet on Mt. Mansfield, Vt. (Faxon); descends to 750 feet near Shelburne, N. H. (Deane); to 400 feet on cliffs, Vt. (Pringle). [*Canadian; Alleghanian.*]

DRYOPTERIS GOLDIEANA (Hook.) A. Gray. Ranges from near sea level northward, (100 feet, Vt. (Pringle)), to 5,000 feet on White Top Mt., Va. (Britton); occurs at 3,500 feet in Swain county, N. C. (Beardslee and Kofoid); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 1,200 feet in Blair county, Pa. (Porter); at 2,500 feet on Willoughby Mt., Vt. (Faxon). [*Alleghanian; Canadian.*]

DRYOPTERIS MARGINALIS (L.) A. Gray. Ranges from sea level along the Atlantic coast from New Jersey northward to 5,000 feet on White Top Mt., Va. (Small); occurs at 1,800 feet on Lookout Mt., Ala. (Mohr); at 4,200 feet on Blowing Rock Mt.,

N. C. (Small and Heller); at 2,700 in Garrett county, Md. (J. D. Smith); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 1,000 feet in Northern Vermont (Brainerd). [*Louisianian; Carolinian; Alleghanian; Canadian.*]

DRYOPTERIS NOVEBORACENSIS (L.) A. Gray. Ranges from sea level along the Atlantic coast, from N. C., northward, to 5,000 feet on White Top Mt., Va. (Mrs. Britton); occurs at 650–900 feet in Northern Alabama (Mohr); at 2,200 feet, near Marion, Va. (Mrs. Britton); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet on the Pocono Mt., Pa. (Porter); at 2,200 ft., Onteora, N. Y. (Miss Vail); at 1,500 feet in Northern Vermont (Brainerd). [*Alleghanian; Canadian?*]

DRYOPTERIS SPINULOSA (Retz.) Kuntze. Ranges from near sea level in New York and New Jersey to 2,600–5,000 feet on White Top Mt., Va. (Mrs. Britton); occurs at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,200 on the Pocono Mt., Pa. (Porter); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 500 feet in Northern Vermont (Brainerd); at 5,000 feet on Mt. Adams, N. H. (Deane). [*Alleghanian; Canadian.*]

DRYOPTERIS SPINULOSA, var. DILITATA (Hoffm.) Underw. Ranges from 500 feet in Northern New Jersey, northward to 6660 feet on Clingman's Dome, N. C. (Beardslee and Kofoid); occurs at 6,000 feet on Grandfather Mt., N. C. (Small and Heller); at 5678 feet on White Top Mt., Va. (Miss Leeming); at 2,300 feet on the Pocono Mt., Pa. (Porter); at 2,600 feet at Avalanche Pass, N. Y., (Britton); at 4,500 feet on the mountains of New England (Deane, Faxon, Brainerd, Pringle). [*Alleghanian; ; Canadian.*]

DRYOPTERIS SPINULOSA, var. INTERMEDIA (Muhl.) Underw. Ranges from near sea level from New Jersey northward to 5,000 feet on White Top Mt., Va. (Mrs. Britton); occurs at 2,000 feet on the Pocono Mt., Pa. (Porter); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 5,000 feet on the mountains of New England (Faxon, Brainerd, Pringle, Deane). [*Alleghanian; Canadian.*]

DRYOPTERIS THELYPTERIS (L.) A. Gray. Ranges from sea level along the Atlantic coast to 2,000 feet in Northern Vermont (Brainerd); occurs at 300 feet in Baltimore county, Md. (J. D.

Smith); at 700 feet at Shelburne, N. H. (Deane). [*Louisianian; Carolinian; Alleghanian.*]

Polystichum acrostichoides (Michx.) Schott. Ranges from near sea level along the Atlantic coast to 2,700 feet in Garrett county, Md. (J. D. Smith); occurs at 2,000 feet in Rabun county, Ga. (Small); at 2,400 feet near Marion, Va. (Judge Brown); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 2,000 feet in Northern Vermont (Pringle, Deane). [*Louisianian; Carolinian; Alleghanian.*]

Polystichum acrostichoides, var. Schweinitzii (Beck.). Near sea level in New Jersey; ascends to 1,500 feet in Habersham county, Ga. (Small); to 2,000 feet on the Pocono Mt., Pa. (Mrs. Britton); to 2.500 feet at Onteora, N. Y. (Miss Vail). [*Alleghanian.*]

Polystichum Braunii (Spenner). (*Aspidium Braunii, Spenner.*) Ranges from 2,000 feet on North Mountain, Sullivan county, Pa., to 5,000 feet at Randolph, Vt. (Churchill); descends to 1,000 feet at Ferrisburg and Williamstown, Vt. (Faxon, Pringle). [*Alleghanian; Canadian.*]

Cystopteris bulbifera (L.) Bernh. Ranges from near sea level northward to 3,500 feet at Mountain Lake, Va. (Britton); occurs at 1,000 feet in Winston county, Ala. (Mohr); at 1,300 feet on Willoughby Mt., Vt. (Deane). [*Carolinian; Alleghanian.*]

Cystopteris fragilis (L.) Bernh. Ranges from near sea level along the Atlantic and Gulf coasts to 5,000 feet on Mt. Washington, N. H. (Faxon); occurs at 1,000 feet in Winston county, Ala. (Mohr); at 3,000 feet on Pond Mt., Va. (Miss Cathcart); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,700 feet at Avalanche Pass, N. Y. (Britton); at 3,000 feet in Northern Vermont (Pringle, Faxon). [*Louisianian; Carolinian; Alleghanian; Canadian.*]

Cystopteris fragilis, var. dentata, Hook. Ranges from 300 feet in Lancaster county, Pa. (Porter), to 5,500 feet on Roan Mt., N. C. (J. D. Smith). [*Alleghanian; Canadian?*]

Onoclea sensibilis L. Ranges from sea level along the Atlantic and Gulf coasts to 3,200 feet in Preston county, W. Va. (J. D.

Smith); occurs at 2,100 feet in Smith county, Va. (Mrs. Livermore); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 1,200 feet at Jaffrey, N. H. (Deane); at 1,000 feet in Northern Vermont (Brainerd, Pringle.) [*Louisianian; Carolinian; Alleghanian.*]

ONOCLEA STRUTHIOPTERIS (L.) Hoffm. Ranges from near sea level along the northern Atlantic coast, (New Jersey and northward), to 2,000 feet at Willoughby, Vt. (Rusby); ascends to 1,200 feet in Bald Eagle Valley, Pa. (Porter). [*Alleghanian.*]

Woodsia alpina (Bolton.) S. F. Gray (WOODSIA HYPOBOREA R. Br.). At 2,000–4,200 feet on Mt. Mansfield, Vt. (Faxon, Pringle); descends to 2,000 feet on Mt. Willoughby, Vt. (Faxon, Pringle). [*Canadian.*]

WOODSIA GLABELLA R. Br. At 4,000 feet on Mt. Mansfield, Vt. (Faxon); descends to 1,500 feet on the same mountain (Pringle); to 1,000–2,500 feet at Willoughby, Vt. (Faxon); to 900 feet at Gorham, N. H. (Deane). [*Canadian; Alleghanian?.*]

WOODSIA ILVENSIS (L.) R. Br. Ranges from near sea level from Northern New Jersey northward to 5,000 feet on Mt. Lincoln, N. H. (Faxon); occurs at 5,000 feet at Randolph, N. H. (Churchill); at 3,000 feet on Mt. Mansfleld, N. H. (Faxon); at 2,000 feet at Crawford Notch, N. H. (Faxon); at 900 feet at Gorham, N. H. (Deane); at 1,800 feet at Plattekill Clove, N. Y. (Miss Vail); at 700 feet in Lycoming county, Pa. (Small & Heller); at 250 feet in Bucks county, Pa. (Porter). [*Alleghanian; Canadian.*]

WOODSIA OBTUSA (Spreng.) Torr. Ranges from near sea level in Northern New Jersey and northward to 2,200 feet at Broad Ford, Va, (Mrs. Britton); occurs at 1,000 feet in Winston county, Ala. (Mohr); at 1,500 feet in Alleghany county, Md. (J. D. Smith); at 1,000 feet in Northern Vermont (Brainerd). [*Alleghanian.*]

DICKSONIA PUNCTILOBULA (Michx.) A. Gray. Ranges from near sea level along the Atlantic coast from New Jersey northward to 5,678 feet on White Top Mt., Va. (Small); occurs at 1,200 feet in Winston county, Ala. (Mohr); at 4,500 feet on Blowing Rock Mt., N. C. (Small & Heller); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet on the Pocono Mt., Pa. (Porter); at 2,000 feet at Onteora, N. Y. (Miss Vail); at 2,000 feet in Northern Vermont (Brainerd). [*Carolinian; Alleghanian; Canadian.*]

TRICHOMANES PETERSI A. Gray. At 1,000 feet along Black Creek, Etowah county, Ala. (Mohr), and from 1,000–1,200 feet along the Sipsey River, Ala. (Peters). [*Carolinian.*]

TRICHOMANES RADICANS Swartz. At 600 feet in Marion county, Ala. (Mohr); at 1,000 feet in Hale county, Ala. (E. A. Smith); at 1,000 feet in Winston county, Ala. (Mohr). [*Louisianian; Carolinian.?*]

LYGODIUM PALMATUM (Bernh.) Swartz. Ranges from near sea level in Massachusetts and New Jersey to 2,100 on the Pocono Plateau, Pa. (Porter). [*Alleghanian.*]

OSMUNDA CINNAMOMEA L. Ranges from sea level along the Atlantic coast to 5,678 feet on White Top Mt., Va. (Mrs. Britton); occurs at 3,000 feet in Rabun county, Ga. (Small); at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet on the Pocono Mt., Pa. (Porter); at 2,000 feet in Greene county, N. Y. (Miss Vail); from 90–1,000 feet in Northern Vermont (Pringle, Brainerd). [*Louisianian; Carolinian; Alleghanian; Canadian.*]

OSMUNDA CINNAMOMEA, forma FRONDOSA (A. Gray). Britton. Ranges from sea level in New Jersey and New York to 3,000 feet on Pine Mt., Grayson county, Va. (Small). [*Carolinian; Alleghanian.*]

OSMUNDA CLAYTONIANA L. Ranges from sea level along the Northern Atlantic coast (New Jersey to Maine) to 5,000 feet on White Top Mt., Va. (Mrs. Britton); occurs at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet on the Pocono Mt., Pa. (Porter); at 2,200 feet near Onteora, N. Y. (Miss Vail); from 90–1,000 feet in Northern Vermont (Brainerd, Pringle), and from 700–1,000 feet in Coos county, N. H. (Deane). [*Alleghanian.*]

OSMUNDA REGALIS L. Ranges from sea level along the Atlantic coast to 3,000 feet on Brushy Mt., Va. (Small); occurs at 2,700 feet in Garrett county, Md. (J. D. Smith); at 2,000 feet on the Pocono Mt., Pa. (Porter); at 2,000 feet at Onteora, N. Y. (Miss Vail); from 90–1,000 feet in Northern Vermont (Pringle, Brainerd); at 1,000 feet in Coos county, N. H. (Deane). [*Louisianian; Carolinian; Alleghanian.*]

Notes upon various Species of Iridaceæ and other Orders.

By Thomas Morong.

IRIDACEÆ.

Two species of *Iris* must be added to the list of those within the range of A. Gray's Manual, Ed. 6, and one other if Canada be included.

Iris Germanica, L., the great violet-colored flag of Middle Europe, was found by Mr. A. A. Heller during the last year apparently well established near Mt. Crawford, Western Virginia. Probably a garden escape.

Iris Missouriensis, Nutt. (*I. Tolmieana*, Herb.) occurs in Missouri and Nebraska, and more commonly towards the southwest.

Iris Hookeri, Penny, Steud. Nom. Bot. Pt. 1, 822 (1840). This has been established as a good species by Mr. Watson (Coult. Bot. Gaz. xii. 100). It occurs in Newfoundland and along the lower St. Lawrence (Pringle). *I. Canadensis*, which one might at first thought imagine it to be, has not yet been identified. This, as nearly as we can judge, is merely a form of *I. versicolor*, L., but may prove distinct when we come to understand the Canadian species more thoroughly.

Iris tridentata, Pursh, not hitherto detected in our territory, is most commonly called *I. tripetala*, Walter, but Walter's name is antedated by *I. tripetala*, L. f. Supp. 97 (1781), a different species, now transferred to *Moræa*, but remaining a synonym nevertheless.

SISYRINCHIUM.

The species of the Atlantic States should be termed *S. Bermudianum*, L., in spite of the fact that it is not known to occur in Bermuda, as this was undoubtedly the original name given to it by Linnæus. In Sp. Pl. 954, he mentions two forms: "α *S. Bermudiana*," which he says grows in Virginia, and "β *S. Bermudiensis*," which is attributed to the Bermudas. The first is founded upon Plukenet's t. 61, f. 1, and Dillenius' t. 41, f. 49, both of which are evidently our plant, and the habitat cited is Virginia. It differs very essentially from *S. Bermudiense*, the Bermudan plant. Linnæus apparently had not seen this latter plant, as no specimen of it is preserved in his Herbarium (*teste* Hemsley, Brit. Journ. Bot. xxii. 109).

As to the question whether there are two or more species in the Atlantic States, I am very well satisfied after a careful study of all the forms that so far we cannot be sure of more than one. The distinctions made between *S. angustifolium*, Mill. and *S. anceps*, Cav. do not seem to hold. Both have from one to several peduncles, and both have seeds nearly smooth, faintly and deeply pitted. Abundant specimens of both, contained in the Herbarium of Columbia College, as well as specimens collected fresh in the vicinity of the city of New York, show this to be the fact.

S. mucronatum, Mx, is merely a narrow-winged form of *S. Bermudianum*. It seems to me that Dr. Asa Gray, in the first edition of his Manual, named the plant correctly, regarding *anceps* and *mucronatum* merely as forms of *S. Bermudianum*.

The synonymy will stand as follows:

S. Bermudianum, L. Sp. Pl. 954 (1753).
S. angustifolium, Mill. Dict. (1768).
S. anceps, Cav. Diss. 6, 345, t. 190, f. 2 (1788).
S. gramineum, Curtis, Bot. Mag. t. 464 (1799).
S. mucronatum, Mx. Fl. ii. 33 (1803).

ORCHIDACEÆ.

In an article contained in the BULLETIN OF THE TORREY BOTANICAL CLUB, xx. 31, the writer maintained the essential identity of *Habenaria ciliaris* (L.) R. Br. and *Habenaria blephariglottis* (Willd.) Torr.

On the 23d of last July I had a good opportunity to compare the two, then in flower, growing side by side on Staten Island, New York. A critical study of the plants in fresh blossom has led me to modify my opinion to some extent. The thing which had puzzled me the most in my first examination was an intermediate form bearing yellow flowers, with both naked and fringed or cut-toothed petals, *H. blephariglottis* being described in the books as having only white petals with naked margins. Of this intermediate form I found several examples mixed among the two species. This I now believe is a hybrid, and fully accounts for the apparent running together of the two. The real *ciliaris* and *blephariglottis* are perhaps sufficiently distinct to be regarded as separate species. The latter has somewhat smaller, pure white petals, a narrower, oblong tip, and flowers three or four days earlier than *ciliaris* In *ciliaris* the lip broadens in the middle and the corolla is of a deep yellow or orange tint. So far as size and habit, the margins of the petals and the fringe of the lip are concerned, scarcely any distinction between the two seems to exist, and they must be regarded as very closely related. The fact that they hybridize, if nothing else, would show this to be the case.

In that article I also noticed a monstrous form of *H. ciliaris*, obtained by Mr. Henry Ogden in the vicinity of New York. I have now to mention still another irregularity of this species. Mrs. J. C. Wright, of Fairfield, Conn., sends us a proliferous form which has four additional racemes of flowers growing from the summit of the regular raceme. The plant is normal in other respects.

COMMELINACEÆ.

Commelina communis, L., not noted in Gray's Manual. Occurs extensively in and around the city of New York, and along the Susquehanna River in Pennsylvania, from its mouth to the hills above Harrisburg. It may readily be distinguished from *C. Virginica*, L., by its spathe, which is split to the base, and by its glabrous, or nearly glabrous, stem and leaves, and from *C. nudiflora*, L., by its open spathe, generally much broader leaves and more robust habit, as well as by the much larger seeds of the ventral cell, which are rugose and deeply pitted instead of being merely reticulated as in *C. nudiflora*. This species is usually regarded as introduced, but as the writer found it this summer on the Susquehanna, it has every appearance of being native. In this connection, it is worthy of note that Linnæus gives its habitat as "America."

TRADESCANTIA.

Four well marked species of this genus are found within our bounds:

Tradescantia rosea, Vent., occurring from Maryland to Florida and west to Missouri and Texas.

Tradescantia Virginiana, L., not *T. Virginica*, as usually written.

Tradescantia pilosa, Lehm., Nov. Act. Ac. Caes. Leop. xiv. Pt. 2, 822, t. 48 (1828).

This is a good species, entirely distinct from *T. Virginiana*. It has stout stems which are more or less pubescent or pilose, often flexuous (*T. flexuosa*, Raf.), and is especially distinguished by its numerous umbels (1–7), commonly dense and many-flowered, terminal and axillary or on axillary branches. Pedicels and sepals usually glandular hairy. Mr. Eggert, of St. Louis, Mo., in sending specimens from his neighborhood, writes that it has larger leaves and more numerous flowers and blossoms much later than *T. Virginiana* (July).

Tradescantia brevicaulis Raf. Atl. Jour. 150 (1832). Probably the plant named "*T. Virginica*, var. *villosa*, Watson," in Gray's Manual, Ed. 6. This should not be confounded with *T Virginiana*, as it is clearly distinct. A dwarf plant, one to six inches high, or oftentimes acaulescent. The stem, leaves, pedicels and calyx are pilose with long spreading hairs which are seldom if ever glandular. The leaves are narrow and sometimes 12 inches in length; the bracts wider and often larger. Umbels 4 to 12-flowered, with rays 1 to 2 inches long. Corolla rather small, blue or rose-purple.

Mr. Eggert collected this form in Missouri, and writes that it grows on rocky hillsides, and blossoms very early, scarcely any flowers to be seen by the end of May. Rafinesque reports it from Illinois and Kentucky.

SCITAMINEÆ.

Thalia dealbata, Roscoe, recently received from Mr. Eggert, grows in the swamps of Missouri.

AMARYLLIDACEÆ.

Hymenocallis occidentalis (Leconte) Kunth. Specimens of this, obtained the last summer in Missouri by Mr. Eggert, raise the question anew whether we have more than one species in the Atlantic States. Mr. Watson, in Proc. Am. Ac. xiv. 301, describes two species, *H. Palmeri*, S. Wats. and *H. humilis*, S. Wats. as occurring in Florida. Leconte notes four other species growing in the States just north of Florida, of which he writes full and elaborate descriptions, accompanied by excellent drawings of three of them. These species he names *Pancratium Mexicanum*, *P. rotatum*, *P. coronarium* and *P. occidentale*. The last species he assigns to Georgia, Tennessee and Kentucky, and this without much doubt is the same as the Illinois and Missouri plant. As Leconte was a very accurate observer and better acquainted with the habits and forms of these plants than any writer since his time, I have no doubt that he is correct in his conclusions, whether his names are to be adopted or not. Whether any of his species is the old *P. Carolinianum* of Linnæus or not has long been a mooted question. The species of Linnæus is founded upon Catesby's figure (Nat. Hist. Car. i. App. 5), described by Catesby as "Lilio-Narcissus Polianthos," and seen by him in a "bog near Palluchucula, an Indian town on the Savannah river, Georgia." Nothing just like this figure has been found since.

The border of the staminal cup is represented with 2 and 3 large triangular teeth between each pair of stamens, and the flower cluster with 2 spathe-like bracts at the base. Some botanists are disposed to regard this as a rude drawing of *H. rotata* or *H. occidentalis*, while others (*e. g.* Baker in Amaryll. 113) consider it *P. maritimum*, a common European species. Neither Walter nor Elliott profess to have seen it, nor is it contained in any American or European Herbarium. For the present, therefore, we are compelled to regard it as a myth.

H. occidentalis seems quite clearly distinct from *H. lacera*, Salisb. (*H. rotata*, Herb.) which Mr. Watson in the work cited above regards as probably the original of the Linnæan plant.

HÆMODORACEÆ.

Of this order as now arranged by Engler and Prantl, we have only a single genus in this country, namely, GYROTHECA, Salisb. Trans. Lin. Soc. i. 327 (1815).

Heritiera, Gmel. (1791) which Kuntze substitutes for Elliott's *Lachnanthes* had been used two years previously by Dryander (Ait. Hort. Kew. iii. 456) for a genus of the Sterculiaceæ. The older names for Dryander's genus cited by Kuntze, such as *Amygdalus*, Burm. and *Atunus*, Rumpf. are pre-Linnæan. The next in priority appears to be *Gyrotheca*.

A single species only is known:

Gyrotheca capitata (Walt.). It is a little singular that Walter's specific name has been changed into "tinctoria" by all the writers who have quoted him, from Pursh to Kuntze. The plant is placed by Walter among his "Anonymo" genera, the term he uses when he is doubtful about the genus, but his description is so full that no one can doubt what is meant.

The synonymy will stand as follows:

Gyrotheca capitata (Walt.).
Anonymo capitata, Walt. Fl. Car. 68 (1788).
Dilatris Caroliniana, Lam. Ill. i. 127 (1791).
Heritiera Gmelini, Michx. Fl. i. 21 (1803).
Dilatris tinctoria, Pursh, Fl. 30 (1814).
Gyrotheca tinctoria Salisb. Trans. Hort. Soc. i. 327 (1812).
Lachnanthes tinctoria Ell. Sk. i. 47 (1817).
Heritiera tinctoria (Gmel.) Kuntze, Rev. Gen. 699 (1891).

NAIADACEÆ.

Potamogeton Spirillus, Tuckerm. In Britten's Journal of Botany for October, 1893, Mr. A. Bennett, commenting upon my adoption of Tuckerman's name for this species, advances the opinion that it should be called *P. dimorphum*, Raf., on the ground that Rafinesque in his review of Barton's Flora of 1815 in the Monthly Magazine and Critical Review of 1817 proposes this name in the place of *P. diversifolius* used by Barton for what he considers a new species, since that name had already been applied by Rafinesque himself to Michaux's *hybridus*. I should agree to this if we could be sure that Barton meant by his description in 1815, supplemented by his drawing and description in 1823, the plant which we now know as *Spirillus*. I must differ from Mr. Bennett, however, in thinking that *P. Spirillus* was meant. The figure of Barton represents a plant, as Barton himself puts it, with "submersed leaves very delicately filiform," some of those in the plate being over two inches in length. These are exactly the leaves of *P. diversifolius*, Raf. (*P. hybridus*, Michx.), and unlike those of *Spirillus* which are much shorter and broader. The only spikes of fruit shown are emersed ones which are figured as sessile. Now neither *diversifolius* nor *Spirillus* ever has emersed sessile spikes, but they are on peduncles from two to nine lines in length, and usually several times longer than the submersed ones. No Potamogeton answering to this figure in all respects has, so far as I know, been detected since Barton's day either in New Jersey, his locality, or anywhere else in the United States. New Jersey has been pretty thoroughly searched from one end to the other, and we should have been very likely to have seen this erratic form were it there. I am compelled to believe that in spite of his assertion to the contrary, Barton really had some form of Michaux's *hybridus* in hand. In the course of his article Mr. Bennett makes a fling which is unworthy of him, and which I have most certainly done nothing to provoke. He says (p. 295): "but the 'law' that is desired to be forced on us, 'that any species or variety that has been so named under any other species or variety cannot be used in the same genus,' will be of somewhat difficult application. Students certainly will never know, and even monographers will not be safe, as proved by Dr. Morong's own work, where he must (by his own law) change the names of at least three of his species, having failed to ascertain that they were in use before." Mr. Bennett seems to hold me responsible for this "law," whereas it is a rule of nomenclature adopted by our National Association of botanists at their meeting at Madison last August, a meeting at which I was not present, and did not influence in the least. I certainly do approve of it as a good rule, under what is termed the law of priority, a law which Mr. Bennett himself must acknowledge as sound, or his anxious search after the earliest names is useless. I think it would be difficult for Mr. Bennett to show that American botanists have ever manifested a desire to force this or any of their rules in nomenclature upon anybody either in this country or abroad. Certainly we shall lose no sleep if our British cousins choose to follow a different set of rules.

Notes on the Flora of Southeastern Kentucky, with a List of Plants collected in Harlan and Bell Counties in 1893.

BY T. H. KEARNEY, JR.

Last summer while debating the weighty question of the selection of a field for botanical exploration, it occurred to me that the mountain counties of Southeastern Kentucky presented a desirable region. Here was a country almost overlooked by the collector. Since Rafinesque made his journey to the "Wasioto or Cumberland Mountains," little work had been done in that part of the State. Moreover, the position of that country on the southern edge of the northern flora, as usually defined, seemed to promise the finding of southern plants new to the northern range.

Unfortunately I was unable to get into the field before the first of August. Leaving Knoxville on that date, I went to Pennington's Gap, Va., on a branch of the L. & N. R. R. Here I secured the services of a negro, a team of mules and a wagon, and by means of this combination reached Harlan C. H., Ky., after a ride of twenty-five miles over the roughest road imaginable.

Leaving Pennington's, we followed the North Fork of Powell's River through the gap in the main range of the Cumberland Mountains. Then the road crossed Little Black Mountain, a parallel ridge, and descended gradually into the valley where the three "forks" unite to form the Cumberland River.

Harlan "Town" proved to be a fair type of the Southern mountain village—dirty, exceedingly ugly and thoroughly lawless. A stay of a few days here convinced me that I must get further into the mountains to secure good results, though at least one plant of interest, *Viola villosa*, Walt., was found here. It is a well marked species, and no one who has seen it growing would consider it otherwise. The roundish, cordate or reniform leaves lie flat on the ground. The appressed pubescence of the upper surface gives it a silvery appearance. The under surface is purplish on the veins, or sometimes the whole surface has a purple hue. In the same vicinity, *Clethra acuminata*, Michx., *Oxalis recurva*, Ell., *Magnolia tripetala*, L. and *Houstonia tenuifolia*, Nutt. were collected.

From Harlan I went up the Poor Fork of the Cumberland, by the same primitive conveyance, to Poor Fork Postoffice, about twenty-one miles above Harlan. Here, at the house of the worthy and hospitable postmaster, I stayed for nearly a month.

The Poor Fork flows through a narrow valley between two ranges of the Cumberland system, the Big Black and the Pine Mountain. The Big Black Mountain is over 3,000 feet high at points; the Pine is much lower. In geological formation, the district is almost entirely sandstone and shale. On the Pine there is an occasional outcropping of limestone.

In the immediate vicinity of Poor Fork I collected *Campanula divaricata*, Michx., *Hydrastis Canadensis*, L., *Panicum capillare campestre*, Gattinger, and *Panicum ramulosum*, Michx. (growing on moist shale on the river bank). A form of *Acalypha Virginica* L. with every part, even the bracts, much reduced in size, was abundant in a low, sandy field.

On the Big Black Mountain, *Azalea lutea*, L.; *Galium latifolium*, Michx.; *Carex aestivalis*, M. A. Curtis; *Trautvetteria Carolinensis* (Walt.) A. M. Vail; *Astilbe biternata* (Vent.) Britt. (*A. decandra*, Don.) and *Holcus lanatus*, L., appeared.

On a spur of the Big Black known as Benham's Spur, *Panax quinquefolia*, L.; *Thalictrum coriaceum* (Britt.) Small*; *Aruncus Aruncus* (L.) Karst.; *Magnolia Fraseri*, Walt.; *Hystrix Hystrix* (L.) MacMillan, and *Corycarpus diandrus* (Michx.) Kuntze were found.

The Pine Mountain presented a more varied and interesting flora. *Magnolia macrophylla*, Michx., very conspicuous because of the whitened under surface of its huge leaves, with large ovoid or semi-globose cones of a dull flesh-color, *Solidago erecta*, Pursh, *Aster leiophyllus lanceolatus*, Porter, *Meibonnia laevigata* (Nutt.) Kuntze, *Clintonia umbellata* (Michx.) Torr., *Disporum lanuginosum* (Michx.) Britt. and *Pogonia trianthophora* (Sw.) B. S. P. were collected on its slopes.

A ledge of exposed, dry sandstone at the summit yielded *Capnoides sempervirens* (L.) Borkh., *Lechea racemulosa*, Michx., rather depauperate specimens of *Gnaphalium Helleri*, Britt., *Eupatorium*

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* Mem. Torr. Club, iv. 96.

pubescens, Muhl., *Agrostis intermedia*, Scribn.,* *Panicum commutatum latifolium* Scribn. n. var.† and a *Lysimachia*, nearest to *L. radicans*, but differing in its erect habit and broader and shorter leaves, less pointed at either end.

On the shaded north side of this ledge *Heuchera Rugelii*, Shuttlew., *Peramium pubescens* (Willd.) C. C. Curtiss, *Leptorchis liliifolia* (L.) Kuntze, and *Asplenium montanum*, Willd., were found.

After several weeks spent in the neighborhood of Poor Fork, I resolved to try the valley of the Cumberland at some point further down. Leaving my quarters in Harlan county, I had a two days' ride over an abominable road to Wasioto, a small lumber town fifty-five miles below Poor Fork Postoffice, and about one mile above Pineville, the county-seat of Bell county.

Along the road I saw great quantities of *Panicum flexile* (Gattinger) Scribn.,‡ a species resembling *P. capillare*, but very distinct.

About nine miles above Wasioto the Cumberland enters a gorge locally known as the "Narr's" (Narrows), through which it flows for several miles. Here, on the bluffs, many interesting plants were collected. Among them I would mention *Rubus odoratus*, L., *Stuartia pentagyna*, L'Hér., *Scutellaria saxatilis*, Riddell, *Aster prenanthoides*, Muhl., and a *Houstonia* which I refer, doubtfully, to Pursh's *H. tenella*.§

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* "Spikelets not crowded, pedicels capillary, usually much longer than the spikelets; flowering glume about ¾ line long, sometimes with a short and delicate dorsal awn.

"Culms erect or geniculate below, 2–3 ft. high; leaves spreading, 2–6 lines wide, the uppermost 4–8 in. long; panicle 7–14 in. long, pyramidal, the rather firm branches at first erect, those uppermost often spreading while the base of the panicle is yet included in the loose, upper leaf-sheath. Spikelets less crowded and smaller than in *A. elata*, with the flowering glume broader at the more rounded apex.

"Intermediate between *A. elata* and *A. perennans*."

† "Leaves very broad, panicle large, the widely spreading branches few-flowered."

‡ *Panicum capillare flexile*, Gattinger, Cat. Tenn. Fl., 94 (1887).

§ ***Houstonia tenella***, Pursh, Fl. Am. Sept. 106?

Aspect and habit of *H. serpyllifolia*. Perennial by extensively creeping, filiform rootstocks. Stems slender, smooth, much branched. Leaf 5–7 mm. long, oblong-spatulate, obtuse or slightly pointed at apex, tapering into a slender petiole from one-fourth to twice as long, conspicuously veined; the upper surface, with the margin and petiole, furnished with scattered, strigose, white hairs; flowers few on very long peduncles, deep blue, about one-half as large as those of *H. serpyllifolia;* tube of corolla very slender, about twice as long as the lobes and 3 to 4 times as long as the lobes of the very small calyx. Mature fruit not seen.

For the entire fifty miles between Poor Fork and Wasioto, the Pine Mountain remains the same in height and character. It is only broken at Wasioto, where the Cumberland passes through it. The Black Mountain, however, breaks up into a number of lesser ridges, of which the chief is known as the Log Mountain.

The Pine still proved the most interesting collecting ground. In a ravine on the south slope, a single specimen of the rare and little-known *Gaylussacia ursina* (M. A. Curtis) Torr. & Gray, a much branched shrub about 1 m. in height, was found. The best it could yield in the way of inflorescence or fruit was a few clusters of apparently unfertilized ovaries. *Lobelia puberula*, Michx., *Galax aphylla*, L., and the magnificent grass, *Erianthus contortus*, Ell., also appeared in the ravine.

On the dryer ridges of the Pine, *Eupatorium verbenæfolium*, Michx., *Chrysopsis graminifolia*, Nutt., *Juncus biflorus*, Ell., and an interesting little *Panicum* with membranaceous leaf-margins, *Panicum nitidum crassifolium*, A. Gray, possibly Elliott's *P. ciliatum*, flourished. In the richer soil of the north slope grew *Aristolochia Sipho*, L'Hér., *Pyrularia pubera*, Michx., *Cimicifuga Americana*, Michx. and *Eupatorium sessilifolium* L.

In the neighborhood of Wasioto, a well-marked variety of *Panicum capillare*, *Panicum capillare geniculatum* Scribn.,* was found to be frequent in the loose soil of railroad embankments.

On Clear Creek, *Oxypolis rigida* (L.), Raf.,† *Solidago arguta*, Ait., *S. patula*, Muhl. and *S. Curtisii*, Torr. & Gray, were collected. On dry slate along the same stream *Phyllanthus Carolinensis*, Walt., and *Aster dumosus*, L., were found.

Towards the end of September I left Kentucky, regretting much that circumstances had not permitted me to begin collecting earlier in the season in a country whose flora would seem to promise so much of interest.

Appended is a complete list of the plants collected in Bell and

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* "Culms usually prostrate or ascending, geniculate or much branched, with numerous oblong or ovate diffusely branched panicles. Spikelets more numerous than in var. a [the ordinary form]. This corresponds to var. *geniculatum* of *P. proliferum*."

† *Tiedemannia rigida*, Coult. and Rose.

Harlan counties. For the names of the grasses I am indebted to Prof. F. Lamson-Scribner.

176. *Asplenium montanum*, Willd.
323. *Asplenium Trichomanes*, L.
48, 210, 395. *Camptosorus rhizophyllus* (L.) Link.
47. *Cystopteris fragilis* (L.) Bernh.
142. *Dicksonia punctilobula* (Michx.) A. Gray.
389, 573. *Dryopteris intermedia* (Muhl.) A. Gray.
61. *Dryopteris marginalis* (L.) A. Gray.
211. *Dryopteris Novæboracensis* (L.) A. Gray.
129. *Polypodium vulgare*, L.
566. *Pteris aquilina*, L.
130. *Tsuga Canadensis* (L.) Carr.
2, 134, 436. *Alisma Plantago*, L.
187. *Sagittaria latifolia*, Willd.
23. *Agrostis alba*, L., var.
221, 283, 367, 382. *Agrostis elata*, Trin. (?)
39, 174. *Agrostis intermedia*, Scribn.
381. *Agrostis perennans*, Tuckerm.
384. *Andropogon nutans*, L.
364, 377. *Andropogon provincialis*, Lam.
379. *Andropogon scoparius*, Michx.
313, 368. *Aristida gracilis*, Ell.
314. *Aristida purpurascens*, Poir.
365. *Arundinaria gigantea tecta* (Walt.) Scribn. [*Arundo tecta*, Walt.].
36, 74, 279. *Brachyelytrum erectum* (Schreb.) Beauv.
276. *Bromus ciliatus purgans* (L.) A. Gray.
375. *Cinna arundinacea*, L.
235. *Corycarpus diandrus* (Michx.) Kuntze.
43. *Danthonia spicata*, Beauv.
140. *Eleusine Indica* (L.) Gaertn.
236. *Elymus Canadensis*, L.
196, 263, 370. *Eragrostis capillaris*, Nees.
150. *Eragrostis Frankii*, Meyer.
55. *Eragrostis hypnoides* (Lam.) B. S. P.
28, 158. *Eragrostis Purshii*, Schrad.
385. *Erianthus contortus*, Ell.
93. *Holcus lanatus*, L.
371. *Homalocenchrus Virginicus* (Willd.) Britton.
237. *Hystrix Hystrix* (L.) MacMillan.
383, 578. *Muhlenbergia diffusa*, Schreb.
366. *Muhlenbergia Mexicana* (L.) Trin.
33, 234. *Muhlenbergia tenuiflora* (Willd.) B. S. P.
309, 380. *Panicum agrostidiforme*, Lam.
372. *Panicum anceps*, Michx.

151. *Panicum capillare campestre*, Gattinger.
317, 335, 378, 497. *Panicum capillare geniculatum*, Scribn.
152, 229. *Panicum clandestinum*, L.
34, 54. *Panicum commutatum*, Schultes.
299. *Panicum commutatum latifolium*, Scribn.
316, 425, 567. *Panicum filiforme*, L.
312, 579. *Panicum flexile* (Gattinger) Scribn.
53. *Panicum laxiflorum*, Lam.
52. *Panicum microcarpon*, Muhl.
594. *Panicum nitidum crassifolium*, A. Gray.
58, 141. *Panicum nitidum pubescens* (Chapm.) Scribn. [*Panicum laxiflorum pubescens*, Chapm]
315, 374. *Panicum proliferum*, Lam.
35, 50, 57. *Panicum ramulosum* Michx.
20. *Panicum sanguinale*, L.
258, 298, 376. *Panicum Walteri*, Poir.
172. *Panicnm* sp.
195, 253. *Paspalum læve*, Michx.
26, 56, 386. *Paspalum longepedunculatum*, Le Conte.
197. *Paspalum setaceum*, Michx.
373. *Sieglingia flava* (L.) Kuntze.
278, 369. *Sporobolus vaginæflorus* (Torr.) Vasey.
125. 155. *Carex æstivalis*, M. A. Curtis.
119. *Carex cephalophora*, Muhl.
319. *Carex crinita*, Lam.
156. *Carex rosea radiata*, Dewey.
73, 115. *Carex virescens*, Muhl.
281. *Carex* sp.
595. *Cyperus diandrus*, Torr.
201. *Cyperus flavescens*, L.
222, 318. *Cyperus retrofractus*, Torr.
204, 411. *Cyperus strigosus*, L.
463. *Dulichium spathaceum* (L.) Pers.
27, 202. *Eleocharis ovata* (Roth) R. Br.
46. *Kyllingia pumila*, Michx.
24, 205. *Rynchospora glomerata* (L.) Vahl.
428. *Scirpus cyperinus* (L.) Kunth.
149. *Scirpus debilis*, Pursh.
3. *Scirpus polyphyllus*, Vahl.
108. *Scleria pauciflora*, Muhl.
173, 466. *Scleria triglomerata*, Michx.
49, 97. *Fimbristylis capillaris* (L.) A. Gray.
448, 590. *Commelina nudiflora*, L.
21. *Juncus acuminatus*, Michx.
488. *Juncus biflorus*, Ell.
22, 37, 203. *Juncus marginatus*, Rostk.
582. *Chamaelirium Carolinianum*, Walt.

112, 295, 580. *Clintonia umbellata* (Michx.) Torr.
113, 178, 243. *Disporum lanuginosum* (Michx.) Britton.
132, 572. *Medeola Virginiana*, L.
190 *Polygonatum biflorum commutatum* (Schultes) Morong. [*Polygonatum commutatum*, Schultes.]
133, 348, 426. VAGNERA RACEMOSA (L.) Morong. [*Smilacina racemosa*, Desf.]
485. *Smilax glauca*, Walt.
337. *Smilax rotundifolia*, L.
297. *Achroanthes unifolia* (Michx.) Raf.
487. *Gyrostachys simplex* (A. Gray) Kuntze.
429. *Leptorchis liliifolia* (L.) Kuntze.
249, 430, 493. *Peramium pubescens* (Willd.) C. C. Curtiss.
105. *Pogonia trianthophora* (Sw.) B. S. P.
104. *Pogonia verticillata* (Willd.) Nutt.
7, 60. *Alnus serrulata*, Willd.
114, 165. *Betula lenta*, L.
72. *Carpinus Virginica* (Marsh.) Sudworth.
110. *Castanea dentata* (Marsh.) Sudworth.
181. *Fagus atropunicea* (Marsh.) Sudworth.
400. *Quercus alba*, L.
147. *Quercus Prinus*, L.
247. *Quercus tinctoria*, Bartr.
329, 443. *Adicea pumila* (L.) Raf.
336, 441. *Boehmeria cylindrica* (L.) Willd.
342, 533. *Laportea Canadensis* (L.) Gaud.
340, 584. *Pyrularia pubera*, Michx.
41, 84. *Aristolochia Serpentaria*, L.
286, 343, 516, 591. *Aristolochia Sipho*, L'Hér.
410. *Polygonum hydropiperoides*, Michx.
284. *Polygonum Pennsylvanicum*, L.
552. *Polygonum sagittatum*, L.
481. *Polygonum scandens*, L.
447, 515. *Polygonum Virginianum*, L.
70. *Mollugo verticillata*, L.
10, 78, 245. *Anychia Canadensis* (L.) B. S. P.
198. *Anychia dichotoma*, Michx.
32. *Sagina decumbens Smithii* (A. Gray) S. Wats.
209. *Magnolia Fraseri*, Walt.
310. *Magnolia macrophylla*, Michx.
18. *Magnolia tripetala*, L.
5. *Asimina triloba* (L.) Dunal.
575, 593. *Cimicifuga Americana*, Michx.
153. *Clematis Virginiana*, L.
244. *Hydrastis Canadensis*, L.
250, 290. *Thalictrum coriaceum* (Britt.) Small.
163. *Trautvetteria Carolinensis* (Walt.) A. M. Vail.
67. *Caulophyllum thalictroides* (L.) Michx.

6. *Menispermum Canadense*, L.
330, 444, 532. *Lindera Benzoin* (L.) Blume.
216. *Sassafras Sassafras* (L.) Karst.
123, 301. *Capnoides sempervirens* (L.) Borkh.
19. *Podostemon ceratophyllus*, Michx.
1, 128. *Penthorum sedoides*, L.
117. *Astilbe biternata* (Vent.) Britton.
81. *Heuchera Rugelii*, Shuttlew.
44. *Heuchera villosa*, Michx.
154, 294, 555. *Hydrangea arborescens*, L.
87. *Hamamelis Virginiana*, L.
168, 184, 289, 307. *Agrimonia striata*, Michx.
193. *Aruncus Aruncus* (L.) Karst.
71. *Cerasus serotina* (Ehrh.) Loisel.
305. *Cratægus coccinea*, L.
65. *Cratægus Crus-Galli*, L.
226. *Potentilla Monspeliensis*, L. [*P. Norvegica*, L.]
507. *Pyrus arbutifolia* (L.) L. f.
85. *Rosa humilis*, Marsh.
131, 326, 571. *Rubus odoratus*, L.
76. *Baptisia tinctoria* (L.) R. Br.
496. *Cassia nictitans*, L.
439. *Cercis Canadensis*, L.
100. *Clitoria Mariana*, L.
267. *Cracca Virginiana*, L.
328, 442, 558. *Falcata comosa* (L.) Kuntze.
127. *Lespedeza hirta* (L.) Ell.
300, 456, 492. *Lespedeza intermedia* (S. Wats.) Britton.
355, 541. *Lespedeza Nuttallii*, Darl.
126, 392, 494. *Lespedeza procumbens*, Michx.
135. *Lespedeza repens* (L.) Bart.
354, 489, 542. *Lespedeza Virginica* (L.) Britton.
465, 529, 538. MEIBOMIA ANGUSTIFOLIA (Torr. & Gray.) [*Desmodium paniculatum angustifolium*, Torr. & Gray.]
83, 242. *Meibomia grandiflora* (Walt.) Kuntze.
261, 406, 458, 576. *Meibomia lævigata* (Nutt.) Kuntze.
260, 402, 491. *Meibomia Marylandica* (L.) Kuntze.
80. *Meibomia nudiflora* (L.) Kuntze.
457. *Meibomia viridiflora* (L.) Kuntze.
11, 280, 470. *Oxalis recurva*, Ell.
51, 464. *Linum striatum*, Walt.
99, 303, 352, 568. *Linum Virginianum*, L.
164, 265. *Polygala Curtissii*, A. Gray.
139, 177, 421. *Acalypha gracilens*, A. Gray.
275, 327, 445. *Acalypha Virginica*, L.
146. *Euphorbia corollata*, L.
199. *Euphorbia maculata*, L.

523. *Phyllanthus Carolinensis*, Walt.
143. *Rhus copallina*, L.
509. *Ilex opaca*, Ait.
239. *Euonymus Americanus*, L.
240. *Acer*, sp.
223. *Impatiens aurea*, Muhl.
8. *Impatiens biflora*, Walt.
409. *Rhamnus Carolinianus*, Walt.
274, 333, 592. *Ampelopsis quinquefolia* (L.) Michx.
562. *Vitis æstivalis*, Michx.
322, 548. *Stuartia pentagyna*, L'Hér.
136. *Ascyrum hypericoides*, L.
397. *Hypericum Drummondii* (Grev. & Hook.) Torr. & Gray.
256. *Hypericum gentianoides* (L.) B. S. P.
9, 433. *Hypericum maculatum*, Walt.
12, 16. *Hypericum mutilum*, L.
75. *Hypericum prolificum*, L.
220. *Helianthemum majus* (L.) B. S. P.
495, 565. *Lechea minor*, L. [*L. thymifolia*, Michx.]
122, 230, 320. *Lechea racemulosa*, Michx.
246, 345. *Solea concolor* (Forst.) Ging.
13, 102. *Viola villosa*, Walt.
271. *Cuphea petiolata* (L.) Koehne.
66. *Rotala ramosior* (L.) Koehne.
212. *Circæa Lutetiana*, L.
94, 519. *Epilobium coloratum*, Muhl.
15. *Jussiæa decurrens* (Walt.), D. C.
59. *Ludwigia alternifolia*, L.
31. *Ludwigia palustris* (L.) Ell.
116, 148. *Aralia racemosa*, L.
349, 414, 482. *Aralia spinosa*, L.
207. *Panax quinquefolia*, L.
186. *Cicuta maculata*, L.
499. *Oxypolis rigida* (L.) Raf.
287. *Sanicula Canadensis*, L.
95, 241, 423, 547. *Thaspium atropurpureum* (Desr.) Nutt.
118, 293, 596. *Thaspium barbinode* (Michx.) Nutt.
302, 490. *Cornus florida*, L.
17, 546. *Clethra acuminata*, Michx.
89. *Azalea lutea*, L.
206. *Azalea nudiflora*, L.
107. *Gaultieria procumbens*, L.
182. *Kalmia latifolia*, L.
144. *Oxydendrum arboreum* (L.) D. C.
311. *Rhododendron maximum*, L.
417. *Andromeda ligustrina* (L.) Muhl.
550. *Gaylussacia ursina* (M. A. Curtis) Torr. and Gray.

82. *Vaccinum corymbosum*, L.
86, 291. *Vaccinium stamineum*, L.
106, 454, 467. *Galax aphylla*, L.
189. *Lysimachia quadrifolia*, L.
121. *Steironema* sp.
473. *Diosyyros Virginiana*, L.
98, 514. *Asclepias obtusifolia*, Michx.
472, 588. *Cuscuta Gronovii*, Willd.
530. *Phlox maculata*, L.
424. *Prunella vulgaris*, L.
455, 545. *Collinsonia Canadensis*, L,
304, 401. *Cunila Mariana*, L.
64. *Hedeoma pulegioides* (L.) Pers.
157. *Isanthus brachiatus* (L.) B. S. P.
63. *Koellia incana* (Michx.) Kuntze.
228. *Lycopus Virginicus*, L.
92. *Melissa officinalis*, L.
162, 399. *Monarda clinopodia*, L.
469. *Scutellaria lateriflora*, L.
391. *Scutellaria saxatilis*, Riddell.
194. *Stachys cordata*, Riddell.
270. *Trichostema dichotomum*, L.
362, 476, 536, 557. *Chelone glabra*, L.
145. *Dasystoma pedicularia* (L.) Benth.
91. DASYSTOMA LÆVIGATA (Raf.) Britton. [*Gerardia lævigata*, Raf.]
200. *Ilysanthes gratioloides* (L.) Benth.
183, 225. *Mimulus ringens*, L.
273, 501. *Scrophularia Marylandica*, L.
334, 474. *Epiphegus Virginiana* (L.) Bart.
508, 559. *Cephalanthus occidentalis*, L.
68. *Diodia teres*, Walt.
277. *Galium circæzans*, Michx.
159. *Galium latifolium*, Michx.
233. *Galium pilosum*, Ait.
4, 450. *Galium tinctorium*, L.
30, 213, 232, 537. *Galium triflorum*, Michx.
528. *Houstonia purpurea*, L.
396. *Houstonia tenella*, Pursh. ?
40, 77, 388. *Houstonia tenuifolia*, Nutt.
103. *Mitchella repens*, L.
88, 437. *Viburnum acerifolium*, L.
325. *Viburnum Lentago*, L.
45, 169, 227, 344. *Campanula Americana*, L.
124, 581. *Campanula divaricata*, Michx.
224, 468. *Lobelia cardinalis*, L.
79, 254. *Lobelia inflata*, L.

353, 413, 484. *Lobelia puberula*, Michx.
292, 431, 462. *Lobelia syphilitica*, L.
446. *Aster azureus*, Lindl.
161, 390, 535, 570. *Aster divaricatus*, L.
522, 551. *Aster dumosus*, L.
262, 412, 459. *Aster infirmus*, Michx.
356, 526, 549, 569. *Aster lateriflorus* (L.) Britton.
90a. *Aster leiophyllus lanceolatus*, Porter.
350, 451. *Aster patens*, Ait.
435, 525. *Aster prenanthoides*, Muhl.
252, 268, 564. *Aster surculosus*, Michx.
90, 259. *Aster undulatus*, L.
475. *Bidens lævis* (L.) B. S. P.
346, 403, 453. BRACHYCHÆTA SPHACELATA (Raf.) Britton. [*Brachychæta cordata* (Short) Torr. & Gray.]
296, 415. *Cacalia atriplicifolia*, L.
405. *Chrysopsis graminifolia*, Nutt.
266, 427, 540. *Chrysopsis Mariana* (L.) Nutt.
553. *Coreopsis tripteris*, L.
185. *Elephantopus Carolinianus*, Willd.
394, 438. *Elephantopus tomentosus*, L.
191, 393, 432, 502. *Erechthites hieracifolia* (L.) Raf.
218. *Erigeron Canadensis*, L.
331, 520. *Eupatorium ageratoides*, L. f.
486. *Eupatorium album*, L.
175. *Eupatorium pubescens*, Muhl.
166, 214, 398. *Eupatorium purpureum*, L.
416. *Eupatorium serotinum*, Michx.
285, 479. *Eupatorium sessilifolium*, L.
120, 404. *Eupatorium verbenæfolium*, Michx.[*E. teucriifolium*, Willd.]
219. *Gnaphalium Helleri*, Britt.
359, 506, 561. *Helenium autumnale*, L.
179. *Helianthus decapetalus*, L.
96, 171, 180, 217. *Helianthus parviflorus*, Bernh.
192. *Heliopsis helianthoides* (L.) B. S. P.
101, 231. *Hieracium Gronovii*, L.
167, 255, 418. *Hieracium paniculatum*, L.
360, 477, 503, 586. *Lactuca spicata* (Lam.) A. S. Hitchcock.
272. *Pluchea fœtida* (L.) D. C.
339, 460, 556, 589. *Prenanthes altissima*, L.
440. *Prenanthes Serpentaria*, Pursh.
324. *Rudbeckia laciniata*, L.
518. *Rudbeckia spathulata*, Michx.
480. *Sericocarpus asteroides* (L.) B. S. P.
407, 500, 511, 577. *Solidago arguta*, Ait.
585. *Solidago arguta*, Ait. (?)
543. *Solidago bicolor*, L.

357, 504. *Solidago Canadensis*, L.
358, 505, 524, 544. *Solidago Curtisii*, Torr. and Gray.
170, 238, 422, 563. *Solidago erecta*, Pursh.
517. *Solidago flexicaulis*, L.
420. *Solidago nemoralis*, Ait.
109. *Solidago odora*, Ait.
498. *Solidago patula*, Muhl.
531. *Solidago rugosa*, Mill.
269, 583. *Verebesina alternifolia* (L.) Britton. [*Actinomeris squarrosa*, Nutt.]
483. *Verbesina occidentalis* (L.) Walt.
188. *Vernonia gigantea* (Walt.) Britton. [*Vernonia altissima*, Nutt.]

The Solandi Process of Sun Printing.*

The above title might suggest that the following article should appear, if anywhere, in some journal upon physics, or at least not in one devoted strictly to botany. However, its purpose is only to treat a subject in its relation to the study of plant life, and therefore is offered only as a contribution to botanical technique.

The process consists, briefly, in exposing the subject, necessarily somewhat translucent, to the sunlight in a printing frame in common use by photographers, with a sheet of sensitized paper back of the subject, in the same manner as a print is taken from a negative of the ordinary sort. The paper which has thus far proved the most successful has been the "American Aristotype," for the manner of using which full directions accompany the same, and will not be entered into here.

The sun print thus obtained after it has been toned becomes the negative from which the positive picture is printed. To do this quickly and to the best advantage, the negative print is placed back downward in a dish containing a thin layer of common kerosene, care being taken to wipe it free from all surface oil after being removed. This negative saturated with the kerosene is placed face inward upon a clean plate of glass in the printing frame and upon it a fresh sheet of the "Aristo" paper is laid and clamped in place. The printing of the positive in the full sunlight is the work of only a half minute or so, but better results are often obtained by a slower printing in diffused light; in fact the same rules hold good for this form of printing as for that of ordinary negatives taken by means of the camera.

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* The substance of this paper, with many illustrative prints, was presented before Section G., A. A. A. S., Madison, August, 1893.

The process of toning is the same for the positive as the negative, and in the same bath an indefinite number of either or both may be undergoing the process at the same time.

The fact that the object needs to be partially translucent places limitations upon the application of the process, as likewise does the inability to enlarge or reduce the size of the object. There are, however, very many instances when the process may be employed with a considerable degree of satisfaction, and in some cases it is possible to bring out points of structure not recorded by the ordinary methods of photography. The principle is different, for in the one reflected light is ordinarily employed and a surface picture only is obtained; but by the Solandi (Sol and I) process the picture is obtained by the unequal transmission of light through the different parts of the object. For example a leaf variegation may be confined to the surface cells and is easily caught by photography, but not in the sun print. On the other hand the variegation may be more than skin deep and the results may be reversed by the two methods. Any object that is naturally thin enough to permit the passage of light, even feebly, may become a subject for sun printing, the time of exposure being correspondingly increased. Thick leaves like the orange, through which but little light seems to pass will give good prints after an exposure of a few hours, while ordinary leaves, as those of the maple, are quickly done. The orange leaf is a case in point where the sun print reveals in a striking manner the number, size, position, etc., of the oil glands, all of which are not secured in the common photograph. Anything like the venation of leaves is of course secured with full details by the process of transmitted light. In like manner many good records can be made of the various rusts, leaf spots and blights upon foliage, and excellent pictures of wood are secured when thin sections in any direction of the grain are employed.

In the case of leaves the negative may be secured from the freshly gathered specimens without any preparation; but dry objects from the herbarium work fully as well and often better when they are first saturated with the kerosene, in the same way as for the negative sun-prints and wiped free of excess of oil before being placed in the frame.

It was my hope to show to the readers of the BULLETIN actual specimens of the work done by the Solandi process, but it may be even better to present two engravings, as they will indicate that the sun prints may be used for illustrations in printed articles with a fair degree of success. Figure 1 shows a leaf of the common hollyhock badly infested with the rust (*Puccinia malvacearum*, Mont.); this object being chosen as one that is a fair average as pathological specimens go, there being no marked light and dark patches as seen from a surface view. The transmitted light brings out the sori of the *Puccinia* in sufficient prominence to make them fairly distinct and much better than could have been done by ordinary photography. The second is another leaf (*Polygonatum*),

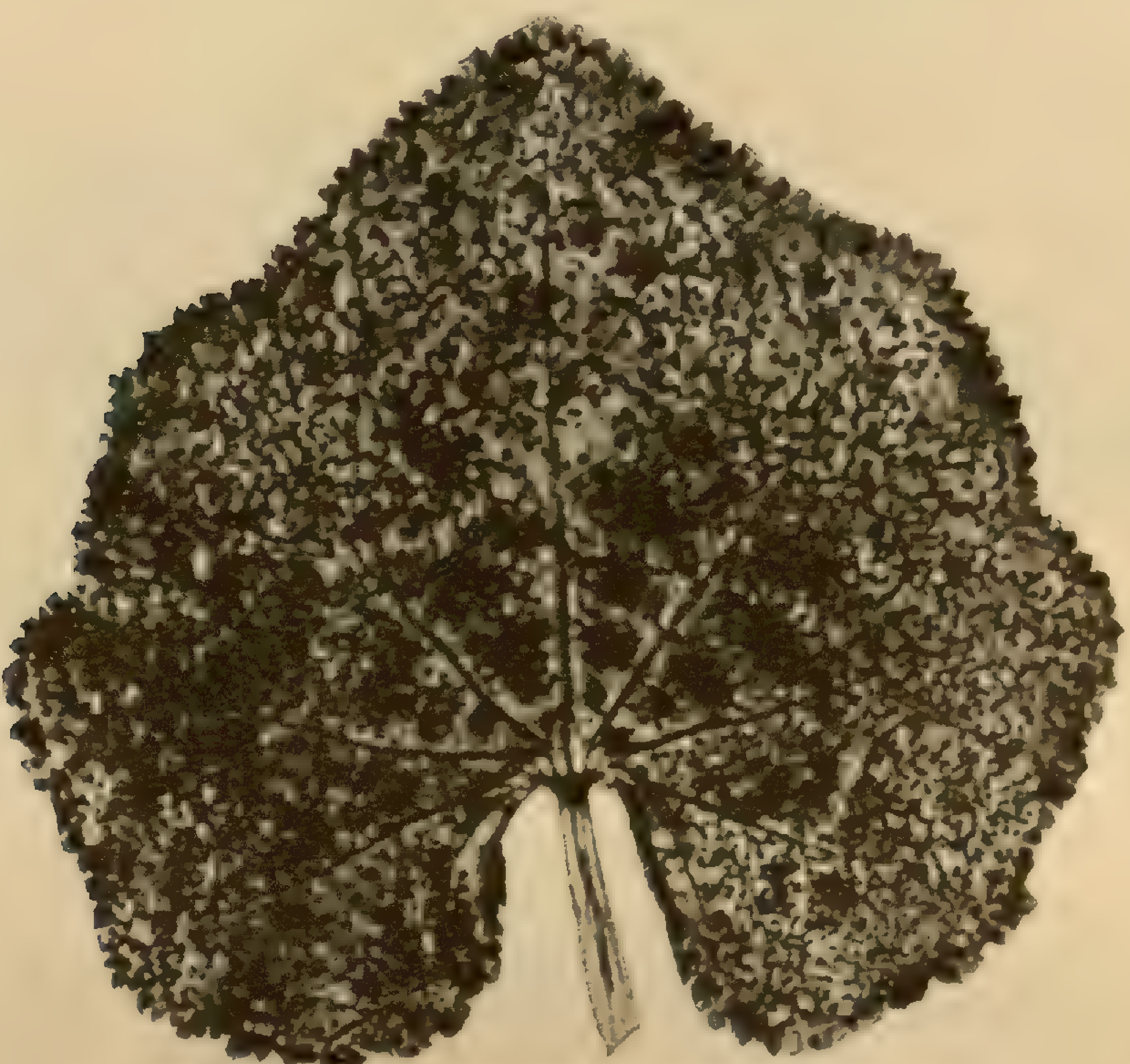

FIG. 1.—HOLLYHOCK LEAF WITH RUST (*Puccinia malvacearum*, Mont.).

but of a widely different class from the mallow, in which the veining is prominent and the work of a leaf miner is illustrated, as also the presence of a blight (*Phyllostica cruenta*, Fr.) following in the wake of the ruin caused by the insect and producing its fruiting pycnidia.

By this process there is no opportunity for any minifying or magnifying of the object, and each detail is as exact as to size, location, etc., as possible. But the strongest points in favor of the process, aside from the merits of the results, are the ease with which the picture may be taken by any one, and the remarkable cheapness, for no camera or dark room is needed, and the whole time for the first exposure of the object until the positive is finished may not be more than three hours.

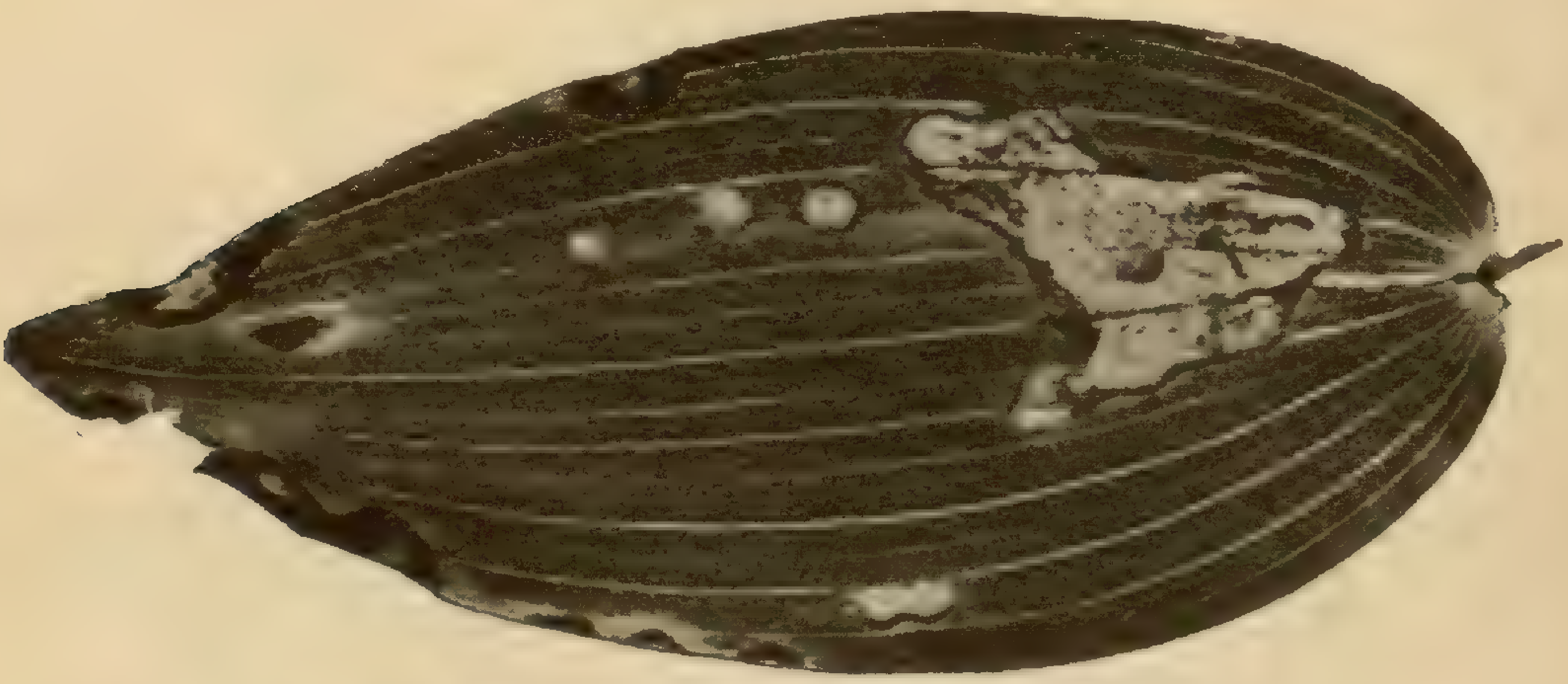

FIG. 2.—LEAF OF *Polygonatum biflorum* with Leaf-Miner, followed by *Phyllosticta cruenta*, FR.

There is nothing new in sun-printing, for Professor Kellerman and other American botanists have employed it. The chief point to be urged is the use of the clarifying agent, kerosene, for subjects when they are dry and for negative prints. This not only diminishes the time of exposure ten fold and more, but remarkably sharpens the details of the positive picture.

BYRON D. HALSTED.

RUTGERS COLLEGE, November 13, 1893.

The Index to recent Literature relating to American Botany.

Following out a recommendation of the Committee on Bibliography and Typography of the Madison Botanical Congress,* the form of our monthly record of American Botanical Literature will be changed in the next volume, so that the citations will be by authors instead of by subjects. It will be set in smaller type than the rest of the BULLETIN, and the titles will be printed off on library cards if a sufficient number of subscribers to these cards is obtained to justify their production. The proposed style of these cards is as here illustrated:

Lagerheim, G. von. Ueber das Vorkommen von Europæischen Uredineen auf der Hochebene von Quito. Bot. Centralb. **54**: 324–331. 1893.

Puccinia coronata and *P. graminis* are recorded as occurring in Ecuador, and *Fusarium uredinis* is described as new.

Matthew, W. D. A Study of the Scale-characters of the Northeastern American Species of *Cuscuta*. Bull. Torr. Bot. Club, **20**: 310–314. *pl. 164, 165.* 10 Aug. 1893.

Description and illustration of the corolla-scales, calyx and ovary of twelve species.

All correspondence concerning these cards should be addressed to

THE CAMBRIDGE BOTANICAL SUPPLY CO.,
CAMBRIDGE, MASS.

It is hoped that the record of papers may be made even more complete than hitherto, and if omissions are noted, it is earnestly requested that the attention of the editors may be called to them. The various journals and serial publications have been divided up among the editors, and Prof. Lucien M. Underwood, Prof. Conway Macmillan, Mr. F. V. Coville and Dr. S. Ely Jelliffe, who have kindly consented to coöperate in the work.

Botanical Notes.

Heliotropism of the Common Mallow.—While in California some years ago my attention was drawn to the common mallow of the Pacific coast (*Malva borealis*) on account of the very marked degree with which it exemplified the turning of leaves toward the sun. At the time a note was made upon the observations for all times of day and night in one of the botanical journals.

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* See *Botanical Gazette*, xvii. 355, and BULLETIN, xx. 371.

The common mallow of the Eastern, Middle and Western States (*Malva rotundifolia*) is no exception, and when growing in rich soil free from all other vegetation the heliotropism is striking enough. While at the Madison meeting of the A. A. A. S., the writer called, in private, the attention of several botanists to the phenomenon, and as it proved to be new to them, the following note is ventured, feeling quite sure that it will call out response from others who have long observed the same thing.

In the morning the blades of the leaves, if the day is clear, will be placed with their upper surface at right angles to the rays of the sun, and, by slowly turning, this position is maintained throughout the day.

Prof. Tracy informs me that the heliotropism of the cotton plant is well known even among the growers of the crops, and this leads one to wonder if the members of the Malvaceæ may not be quite generally influenced in the same way. It would be interesting to learn of the observations in this direction that have been made upon our native plants of the mallow family.

BYRON D. HALSTED.

RUTGERS COLLEGE, October 13, 1893.

Note on Scabiosa australis.—It may be of interest to note that on the 24th of last September I visited the station for *Scabiosa australis* mentioned in the January, 1893, BULLETIN, and found the plant abundant. It is evidently spreading southward. Specimens were noticed in the village of Whitney's Point, two miles south of the original locality.

WILLARD N. CLUTE.

BINGHAMTON, N. Y., October 29, 1893.

Proceedings of the Club.

WEDNESDAY EVENING, NOVEMBER 29TH, 1893.

Dr. J. Bernard Brinton in the chair and sixteen persons present.

The following papers were read:

"On the Genus *Amelanchier*, Medic.," by Dr. N. L. Britton, illustrated by specimens.

"The Geographical Distribution of the Plants of Pennsylvania," by Prof. Thos. C. Porter.

Dr. Britton exhibited a copy of Trew's "Plantæ Selectæ," recently acquired by the botanical library of Columbia College.

Index to Recent Literature relating to American Botany.

Aberrant Forms in Cultivated Diatoms. Samuel Lockwood (Am. Mo. Mic. Journ. xiv. 269–273).
From "Le Diatomiste," June, 1893.

Acer rubrum, var. *Drummondii.* L. Spath (Gartenfl. xli. 357, with colored illustration).

Additions to the Flora of Colorado—Fungi. T. D. A. Cockerell (Zoë, iv. 282).

Aechmea Barleei. H. Witte (Gartenfl. xli. 359, with illustration).

Agave Americana. N. H. George and L. Wittmack (Gartenfl. xli. 269, with figures).

Ampelopsis quinquefolia—A Variety of. E. B. Knerr (Trans. Kansas Acad. Sci. xiii. 69).

Annual Report of the State Botanist of the State of New York. Charles H. Peck (45th Rep. N. Y. State Mus. Nat. Hist., Albany, 1893; reprint).

A list of plants not heretofore recorded from the State is given, fifteen or more species of Fungi are described as new, a study of the New York species of the genus *Omphalia* and other notes.

Asplenieas—Observaciones sobre alcunos Helechos Mexicanos de la Tribu de las. José N. Rovirosa (Naturaleza (Ser. ii.) ii. 179).

With illustrations of species of *Asplenium*, *Darea*, *Cænopteris*, *Athyrium*, *Diplazium*, *Hemidictyum* and *Anisogonium*.

Bacterial Flora of the Atlantic Ocean in the Vicinity of Wood's Holl' Mass. H. L. Russell (Bot. Gaz. xviii. 383–395, 411–419; one plate).

Baptisia leucophæa. (Meehan's Month. iii. 177, with colored plate.)

Biographical Skizzen—I. Friedrich Sellow. Ign. Urban (Engler's Bot. Jahrb. xvii. 177–198).

Biographical sketch of this South American botanical collector, whose specimens have added so much to our knowledge of the flora of Brazil and Uruguay.

Bocconia arborea—Estudios relativos a la. Manuel M. Villada (Naturaleza (Ser. ii.) ii. 207).

Botanical Aspect of Pike's Peak—The. V. Havard (Gard. and For. vi. 452).

Botanical Notes from Texas. E. N. Plank (Gard. and For. vi. 272; 513).

Botanical Notes. Alice Eastwood (Zoë, iv. 186).

Botany of Martha's Vineyard—Observations on the Geology and. Arthur Hollick (Trans. N. Y. Acad. Sci. xiii. 8; reprint).

Brasilianischen Nutz–und Heilpflanzen—Die. Theodor Peckholt (Pharm. Rundsch. xi. 287).

Brassavola glauca. Alexander Bode (Gartenfl. xli. 176, with figure).

Calceolaria andina. J. D. Hooker (Curtis Bot. Mag. xlix. t. 7326). Describes a new species from Chili.

Californian Flora—Southern Extension of. T. S. Brandegee (Zoë, iv. 199).

Californian Uredineæ—New. P. Dietel (Erythea, i. 247–252).

Descriptions of new species in *Uredo*, *Uromyces* and *Puccinia*.

Cane Diseases and Pests in Trinidad. J. H. Hart (Bull. Misc. Infor. Trinidad, Roy. Bot. Gard., June, 1893).

Carduus heterolepis. J. N. Rose (Erythea, i. 234).

Catalogue of the North American Phenogams and Vascular Cryptogams in the Blake Herbarium. F. L. Harvey and F. P. Briggs (Bull. Maine State Coll. Lab. i. No. 2).

Composite Flora of Kansas—The Relations of the. A. S. Hitchcock (Trans. Kansas Acad. Sci. xiii. 89).

Contributions to Western Botany. Marcus E. Jones (Zoë, iv. 254).

Includes a Revision of the American species of Aquilegia north of Mexico, notes on *Townsendia*, and descriptions of new species or varieties in *Thelypodium*, *Caulanthus*, *Lepidium*, *Astragalus*, *Potentilla*, *Frasera*, *Emmenanthe*, *Phacelia*, *Gilia*, *Pentstemon* and *Eriogonum.*

Corrections in Nomenclature—III. Edw. L. Greene (Erythea, i. 206–208).

The name *Forsellesia* is proposed for *Glossopetalon*, A. Gray (1853) not Schreber, and *Bourdonia* for *Keerlia*, A. Gray (1852) not D. C. *Butneria*, Duham., is taken up for *Calycanthus*, L. Two species of *Lotus* and three of *Astragalus*, bearing homonyms, are re-named.

Corrections in Nomenclature—IV. Edw. L. Greene (Erythea, i. 246, 247).

Prof. Greene maintains that his generic name *Carlomohria* should be adopted for *Halesia*, Ellis, and here names the species. He also proposes *Colina* for *Mohria*, Sw., which he holds to be a homonym of *Morea.* Species of *Tradescantia* and *Delphinium* are re-named, and *Mimulus Congdoni*, Robinson, is transferred to *Eunanus.*

Delphinum—Neue Arten der Gattung. E. Huth (Bull. Herb. Boiss. i. 327–336; Pl. 14–17).

D. Penardi and *D. Barbeyi*, from Colorado, and *D. Ehrenbergii*, from Mexico are characterized.

Diatomaceæ of Minnesota. Inter-Glacial Peat. Benjamin W. Thomas (20th Ann. Rep. Geol. and Nat. Hist. Survey of Minnesota; pp. 291–320).

Diatomaceæ—What is a species in the? Arthur M. Edwards (Am. Month. Micr. Journ. xiii. 212).

Dipladenia atropurpurea. (Garden, xliv. 488, with colored illustrations.)

Erythronium mesochoreum. E. B. Knerr; Trans. Kansas Acad. Sci. xiii. 20).

Flora of Bouldin Island. Katharine Brandegee (Zoe, iv. 211).

Flora of Greenland—A Contribution to the. W. E. Meehan (Proc. Acad. Sci. Phila., April, 1893, 205).

Flora of Kansas—Additions to the. B. B. Smyth (Trans. Kansas Acad. Sci. xiii. 96).

Flora of Staten Island—Additions to the. W. T. Davis (Proc. Nat. Sci. Assoc. Staten Island, Oct. 14, 1893).

Flowering Plants and Ferns Collected in Franklin County, Kansas—A List of. W. E. Castle (Trans. Kansas Acad. Sci. xiii. 80.)

Fungi—New West American. J. B. Ellis and B. M. Everhart (Erythea. i. 197–206).

Descriptions of twenty-nine species in various genera.

Fungus from the Coal Measures.—A New. H. Herzer (Am. Geol. xii. 289, 290, Pl. xiii.).

A description of the new genus and species, *Dactyloporus archæus*, from the carboniferous formation in Tuscarawas county, Ohio. It is stated to be generically allied to *Polyporus* as to its sporiferous tubes, and again to *Agaricus* by its pileus and trunk. A wretchedly poor plate, similar in execution to others which have recently appeared in the same publication, accompanies the description.

Georgia (Tetraphis) pellucida et les Espeèces alliées. N. C. Kindberg (Rev. Bryol. xx. 92, 1893).

Four North American species are briefly described, of which two bear new names. *Georgia cuspidata* is said to be different from *G. pellucida* in the curved capsules and excurrent vein of the perichætial leaves. The specimens were collected in Canada by Macoun, and near Columbus, Ohio, by Schrader. We have seen Prof. Macoun's specimens and do not think them worthy of specific rank as the capsules are often curved and the pedicels very variable in length in *G. pellucida;* on the same plant the vein may disappear below the apex in the lower bracts, and be excurrent in the upper.

G. trachypoda is said to differ from *G. geniculata* in the seta being rough above, not below and not geniculate. It will be remembered that Braithwaite cites a variety *curvata*, Lindb., founded on North American specimens of *G. pellucida*, with curved capsules, and that the pedicel of *G. geniculata* is described as rough above the bend, not below. E. G. B.

Gilia superba. Phacelia nudicaulis. Alice Eastwood (Zoë, iv. 296).

The author reduces the two above species to *Gilia subnuda*, Torr., and *Phacelia demissa*, A. Gray.

Gossypium lancæforme, Miers. James Britten (Journ. Bot. xxxi. 330–331).

Description of a new species from Mexico.

Grasses from Mexico—Descriptions of new. George Vasey (Contr. U. S. Nat. Herb. i. 281).

New species of *Paspalum*, *Panicum*, *Aristida*, *Muhlenbergia*, *Sporobolus* and *Eragrostis* are described.

Grasses from the United States—Descriptions of new or noteworthy. George Vasey (Contr. U. S. Nat. Herb. i. 267).

Descriptions of new species of *Stipa*, *Orysopsis*, *Muhlenbergia*, *Sporobolus*, *Bouteloua*, *Sieglingia*, *Eragrostis*, *Melica*, *Poa*, *Festuca*, and *Elymus*.

Grasses—Notes on some Pacific Coast. George Vasey (Contr. U. S. Nat. Herb. i. 265.

Guide to the Study of the Common Plants. Volney M. Spalding (12 mo. pp. xxiii. 246. Boston, Heath & Co., 1893).

Halesia v. *Mohria.* W. Watson (Gard. and For. vi. 486).

Halesia vs. Mohria vel Mohrodendron. J. H. Redfield, N. L. Britton (Gard. and For. vi. 518).

Heuchera sanguinea. (Gartenfl. xli. 617, with colored plate.)

Indefinite Stamens and subsessile Pods in Cleome. Edw. L. Greene (Erythea, i. 233–234).

Introduced Plants in the Arid Region. E. L. Berthould (Bot. Gaz. xviii. 435).

Laminariaceæ—On the Classification and Geographical Distribution of the. William Albert Setchell (Trans. Conn. Acad. ix. 333, reprint).

Leaf-Hair Structures—On certain. Walter C. Blasdale (Erythea, i. 252–257; one plate).

Liatris scariosa. N. E. Brown (Gardn. Chron. xiv. 593, with figure).

Lichens from California and Mexico, collected by Dr. Edward Palmer from 1888–1892—List of. J. W. Eckfeldt (Contr. U. S. Nat. Herb. i. 291).

Lobeliaceous Plants—Two rare. Edw. L. Greene (Erythea, i. 237, 238).

The genus *Baclea* is proposed for the *Nemacladus oppositifolius*, Robinson, and *Bolelia lata* described as new.

Maize—A Botanical and Economic Study. John W. Harshberger (Contr. Bot. Lab. Univ. Penn. i. No. 2, 75–202; three plates).

Masdevallia racemosa. F. C. Lehmann (Gartnfl. xli. 488, illustrated).

Michigan Plants—New and rare. G. H. Hicks (Asa Gray Bull. No. 3, 1893).

Novitates occidentales—V. Edward L. Greene (Erythea, i. 221–224).

New species and varieties are described in *Astragalus, Amelanchier, Saxifraga, Arabis, Senecio* and *Ptiloria.*

Novitates occidentales—VI. Edw. L. Greene (Erythea, i. 258–260).

Descriptions of new species in *Lotus, Helianthemum, Polygonum* and *Uropappus.*

New Plants—Descriptions of three. J. N. Rose (Contr. U. S. Nat. Herb. i. 289).

Ranunculus Cooleyæ and *Ligusticum Macounii* from Alaska, and *Sphæralcea Orcuttii* from the Colorado Desert, are the species described.

New Plants from Texas and Colorado—Descriptions of four. J. M. Holzinger (Contr. U. S. Nat. Herb. i. 288).

Descriptions of *Claytonia Bodini, Baptisia lanceolata,* var. *Texana, Stemodia Schottii,* and *Oxybaphus Bodini.*

Odontoglossum constrictum, Lindl., var. Sanderianum, Rbch. F. Krânzlin (Gartenfl. xli. 65).

Odontoglossum cirrhosum. L. Wittmack (Gartenfl. xli. 593, with colored plate).

Our Native Ferns and their Allies. L. M. Underwood (Fourth Edition, revised, 1893).

The author continues to improve this valuable little book, by bringing the list of publications under each chapter up to date, and incorporating the results of recent investigations and collection, as well as revising the nomenclature to conform to the Rochester Code. It supplies in a handy and inexpensive form much valuable information, and besides its high scientific value is an interesting and attractive addition to the library.

Papaveraceas—Los Alcaloides de las. Manuel M. Villada (Naturaleza (Ser. ii.) ii. 212).

Perityle rotundifolia (*Amauria*). T. S. Brandegee (Zoë, iv. 210).

Phanerogamic Parasites—On the Structure of the Haustoria of Some. George J. Pierce (Ann. Bot. vii. 291, with plates).

Phenogams and Vascular Cryptogams of Maine—A Contribution to the. F. L. Harvey and F. P. Briggs (Bull. Maine State College Lab. i. No 2).

Phyllospadix—The Genus. William Russell Dudley (Wilder Quarter-Century Book, Ithaca, N. Y., 1893, reprint).

A critical study of the genus, with illustrations of *P. Torreyi*

Piñon Gathering among the Parramint Indians. B. H. Dutcher (Am. Anthrop. Oct. 1893).

Describing the gathering of the nuts of *Pinus monophylla.*

Pitcairnia floccosa. L. Wittmack and C. E. Kirschoff (Gartenfl. xli. 352, with figures.)

Plantæ Glazioviana novæ minus cognitæ. P. Taubert (Bot. Jahrb. xvii. 502).

New species from Brazil are described in the genera *Saccoglottis*, *Oxalis*, *Poecilandra*, *Drosera*, *Turnera*, *Klotzschia*, *Didymopanax*, *Gaylussacia*, *Agarista*, *Buddleia*, *Coccoloba*, *Cryptocarya*, *Hufelandia*, *Acrodiclidium*, *Phœbe*, *Ocotea*, *Pellæa*, *Anemia*, and thirteen species of fungi. A new genus in the Gentianaceæ, with one species, *Senæa cærulea*, is also described.

Plants Collected by the Garfield University Expedition of 1889—List of. M. A. Carleton (Trans. Kansas Acad. Sci. xii. 50).

Plant Intelligence. Walter C. Kerr (Proc. Nat. Sci. Assoc. Staten Island, Oct. 14, 1893).

Description of the movements exhibited by the flowering scape of *Eichornia crassipes.*

Plants of Mason County, Mich. H. T. Blodgett (Asa Gray Bull. No. 3, 1893).

Plants New to Florida—List of. J. M. Holzinger (Contr. U. S. Nat. Herb. i. 288).

Popular American Plant Names—II. Fanny D. Bergen (Bot. Gaz. xviii. 411).

Preliminary Report of the Microscopical Organisms of the Brooklyn Water Supply. Smith Ely Jelliffe (Brooklyn Medical Journal, vii. 593–617).

A report is made upon the organisms found during the six months from November, 1892, to May, 1893, and details of the method of examination, a short resumé of the work done in similar lines, the seasonal distribution and the sanitary relationships are discussed. A series of plates giving the comparative abundance of the organisms is given; a partial bibliography of the American titles on the microscopical examinations of water supplies. Three plates, representing most of the organisms that appear in the lists, close the contribution.

Quercus Prinos (Gardn. Chron. xiv. 61, with figure).

Report of the Botanist. L. R. Jones (Report Vermont State Agric. Exp. Sta. for 1892, illustrated).

Report on "Cacao" in Nicaragua. (Bull. Roy. Bot. Gard. Trinidad, Sept., 1893.)

Report upon the Hills of Louisiana, south of the U. S. and P. R. R., to Alexandria, La.—A preliminary. Part II. Otto Lerch (pamph. pp. 159, Baton Rouge, 1893).

This is a characteristic elementary document, designed for popular use. There are some facts in regard to the distribution of plants which are of interest, and these may be found under 'Botanical Notes' on pages 151–158. Thus the trees and shrubs are grouped according to the character of the soil in which they grow, which is always a matter of interest. A list of twenty herbaceous plants is also included, under the heading 'Medicinal Herbs,' and finally there is what purports to be a list of "Grasses." In this latter may be noted species of *Carex*, *Scirpus*, *Cyperus*, *Juncus*, *Eleocharis*, *Rhyncospora*, *Lespedeza* (*!*) etc. A. H.

Rhipsalis Warmingiana. G. A. Lindberg (Gartenfl. xli. 8, with figures).

Riparian Botany of the Lower Sacramento. Willis L. Jepson (Erythea, i. 238–246).

Robinia Neo-Mexicana. L. Wittmark and F. Brettschneider (Gartenfl. xli. 649, with colored plate).

Rodriguezia Calopectron. E. Regel (Gartenfl. xli. 281, with colored plate).

Rubber of the Orinoco—The. A. Ernst (Bull. Misc. Infor. Trinidad, Roy. Bot. Gard., June, 1893).

Describing *Hevea Brasiliensis* and the methods by which the rubber is collected.

Rust of Mountain Ash—The. Byron D. Halsted (Gard. and For. vi. 508).

Note on *Gymnosporangium globosum.*

Salvinia natans on Staten Island. W. C. Kerr (Proc. Nat. Sci. Assoc. Staten Island, October 14, 1893).

Record of its recent introduction.

Sap of Trees and its Movements—The so-called. Charles R. Barnes (Science, xxi. 239–241).

An address delivered before the State Horticultural Society of Wisconsin.

Sectioning Fern Prothallia and other delicate Objects. W. B. Thomas (The Microscope (II.) i. 167–168).

Selective Absorption of Heat by Leaves. G. A. Meyer (Trans. Kansas Acad. Sci. xiii. 48).

Senecio sagittifolius. J. D. Hooker (Curtis Bot. Mag. xlix. t. 7322).

Describes a new species from Uruguay.

Serjania-Arten—Drei neue. L. Radlkofer (Bull. Herb. Boiss. i. 464–468).

S. alurigera from Peru, *S. lateritia* from Guatemala, and *S. didymadenia* from Bolivia (Rusby, 517, distributed as *S. clematidifolia*, Camb.?).

Skizze der Vegetationsverhaltnisse von Santiago in Chile. Fr. Meigen (Engler's Bot. Jahrb. xvii. 199–294).

A general account of the flora of the region, supplemented by a list of several hundred species collected by the author, novelties being described in the following genera: *Calceolaria*, *Draba*, *Gilia* *Œnothera*, *Pernettya*, *Senecio*, *Solanum* and *Valeriana.*

Sudamerikanische Hochgebirgspflanzen. W. Siber (Gartenfl. xli. 425, 452). With colored illustrations of *Paranephelius uniflorus*, *Espeletia grandiflora*, *Eryngium pumillum* and *Veronica cupressoides.*

Taxodium distichum. Maxwell T. Masters (Gardn. Chron. xiv. 659, with figure.)

Texas Trees—Notes on Some of the. J. Reverchon (Gard. and For. vi. 503).

Æsculus arguta, *Sapindus marginatus*, *Rhus copalina*, var. *lanceolata*, *Sophora affinis*, *Prosopis juliflora* and *Bumelia lanuginosa* are the species discussed.

Tillandsia Lorentziana Griseb. und andere Argentinische Arten—Bemerkungen zu. F. Kurtz (Gartenfl. xli. 404).

Uredineæ of the San Francisco Bay Region—The. W. C. Blasdale (Asa Gray Bull. No. 3, 1893).

Vagrant Crucifers. John Higgins (Asa Gray Bull. No. 3, 1893).

Variations in Dominant Species of Plants. W. A. Carleton (Trans. Kansas Acad. Sci. xiii. 24).

Victoria regia. H. Gaerdt (Gartenfl. xli. 651).

Vitis Baileyana, Munson. T. V. Munson (Leaflet, pp. 2, dated June 20, 1893, issued November, 1893).

Description of the grape first described by Mr. Munson as *V. Virginiana;* this name being a homonym of a Lamarckian species is here changed to the above.

Vitis in Kansas—The Distribution of the Genus. A. S. Hitchcock (Trans. Kansas Acad. Sci. xiii. 79).

Water Lily Trees—The. F. W. Burbidge (Garden, xliv. 438). With colored illustration of *Magnolia Fraseri.*

West American Coniferæ—Notes on—III. J. G. Lemmon (Erythea, i. 224–231).

Mr. Lemmon here discusses the synonymy and nomenclature of the Monterey Pine and the Knob-cone Pine, and concludes that the former should be known as *Pinus radiata*, Don, and the latter as *P. attenuata*, Lemmon.

Western Kansas—Some Notes on Condensed Vegetation in. Minnie Reed (Trans. Kansas Acad. Sci. xiii. 91).

Winter-Killing of Trees and Shrubs—The. Aven Nelson (Wyoming Exper. Sta. Bull. No. 15, 1893).

Contributions from the Herbarium of Columbia College.

No. 1. A Preliminary List of North American species of *Cyperus*, with Descriptions of New Forms. By N. L. Britton (1886), ... 25 cents.

No. 2. *Cerastium arvense*, L., and its North American Varieties. By Arthur Hollick and N. L. Britton (1887). (Out of print.)

No. 3. Plant Notes from Temiscouata County, Canada. By J. I. Northrop (1887). (Out of print.)

No. 4. A List of Plants Collected by Miss Mary B. Croft at San Diego, Texas. By N. L. Britton and H. H. Rusby (1887), ... 25 cents.

No. 5. New or Noteworthy North American Phanerogams. By N. L. Britton (1888), ... 25 cents.

No. 6. An Enumeration of the Plants Collected by Dr. H. H. Rusby in South America, 1886–1887. By N. L. Britton. (Twenty-three parts published; not yet completed.)

No. 7. The Genus *Hicoria* of Rafinesque. By N. L. Britton (1888), . . 25 cents.

No. 8. A Recent Discovery of Hybrid Oaks on Staten Island. By Arthur Hollick. (1888), ... 25 cents.

No. 9. A List of Plants Collected by Dr. E. A. Mearns at Fort Verde and in the Mogollon and San Francisco Mountains, Arizona, 1884–1888. By N. L. Britton.

The General Floral Characters of the San Francisco and Mogollon Mountains and the Adjacent Region. By H. H. Rusby (1888), ... 25 cents.

No. 10. Contributions to American Bryology—An Enumeration of the Mosses Collected by Mr. John B. Leiberg in Kootenai County, Idaho. By Elizabeth G. Britton. (Out of print.)

No. 11. Preliminary Notes on the North American Species of the Genus *Tissa*, Adans. By N. L. Britton (1889), ... 25 cents.

No. 12. The Genus *Eleocharis* in North America. By N. L. Britton (1889), 25 cents.

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No. 14. A List of State and Local Floras of the United States and British America. By N. L. Britton (1890), ... $1.

No. 15. A Descriptive List of Species of the Genus *Heuchera*. By Wm. E. Wheelock (1890), ... 25 cents.

No. 16. New or Noteworthy North American Phanerogams, III. By N. L. Britton (1890), ... 25 cents.

No. 17. The Flora of the Desert of Atacama. By Thos. Morong (1891), 25 cents.

No. 18. Contributions to American Bryology, II. A supplementary Enumeration of Mosses collected by Mr. John B. Leiberg in Kootenai County, Idaho. By Elizabeth G. Britton (1891), ... 25 cents.

No. 19. Notes on North American Halorageæ. By Thos. Morong (1891), 25 cents.

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No. 23. The American Species of the Genus *Anemone* and the Genera which have been referred to it. By N. L. Britton (1891), 25 cents.

No. 24. Review of the North American Species of the Genus *Xyris*. By Heinrich Ries (1892), 25 cents.

No. 25. A Preliminary List of the Species of the Genus *Meibomia* occurring in the United States and British America. By Anna M. Vail (1892), 25 cents.

No. 26. A List of Species of the Genera *Scirpus* and *Rynchospora* occurring in North America. By N. L. Britton (1892), 25 cents.

No. 27. Note on a Collection of Tertiary Fossil Plants from Potosi, Bolivia. By N. L. Britton (1892), 25 cents.

No. 28. The Anatomy of the Stem of *Wistaria Sinensis*. By Carlton C. Curtiss (1892), 25 cents.

No. 29. New or Noteworthy North American Phanerogams, VI. By N. L. Britton (1892), 25 cents.

No. 30. *Ranunculus repens* and its Eastern North American Allies. By N. L. Britton (1892), 25 cents.

No. 31. A Preliminary List of American Species of *Polygonum*. By John K. Small. (1892), 25 cents.

No. 32. West Virginia Mosses. By Elizabeth G. Britton (1892), 25 cents.

No. 33. A New Species of *Listera*, with Notes on Other Orchids. By Thos. Morong. (1893), 25 cents.

No. 34. The North American Species of *Lespedeza*. By N. L. Britton (1893), 25 cents.

No. 35. An Enumeration of the Plants Collected by Dr. Thos. Morong in Paraguay 1888–1890. By Thomas Morong and N. L. Britton, with the assistance of Miss Anna Murray Vail (1892–1893), $1.50

No, 36. An Examination of the Seeds of some Native Orchids. By Carlton C. Curtiss (1893), 25 cents.

No. 37. Further Notes on American Species of *Polygonum*. By John K. Small (1893), 25 cents

No. 38. New or Noteworthy North American Phanerogams, VII. By N. L. Britton (1893), 25 cents.

No. 39. Contributions to American Bryology, III.—Notes on the North American Species of *Orthotrichum*. By Elizabeth G. Britton, 25 cents.

The whole series with the exception of Nos. 2, 3, 6 and 10 will be supplied for $5.

Copies of the Catalogue of Plants found in New Jersey (1889), by N. L. Britton, may be had for $2.

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DR. THOS. MORONG,

Curator of the Herbarium, Columbia College,

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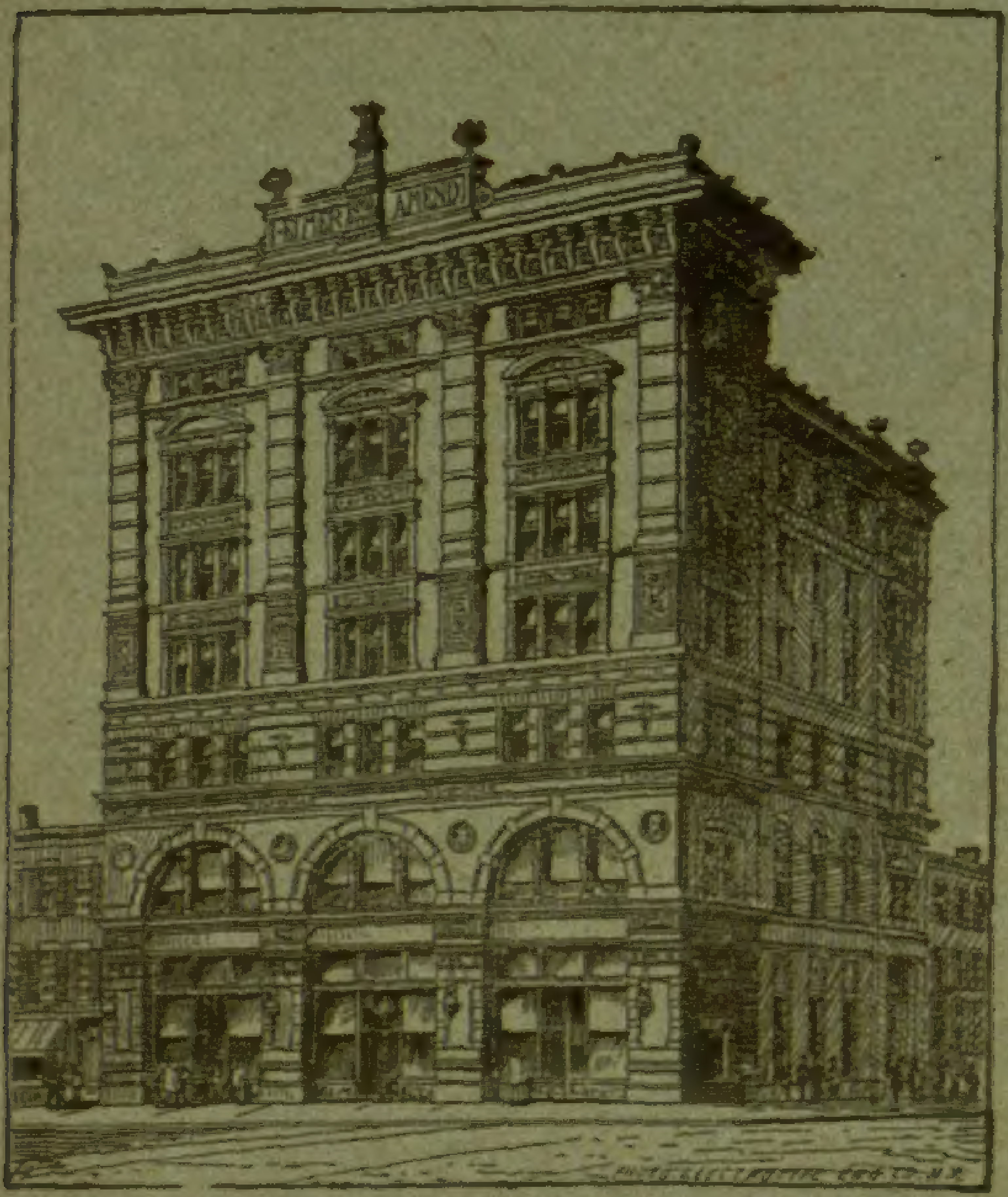

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